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VOLUME XIV OCTOBER 5, 1925 NUMBER 17

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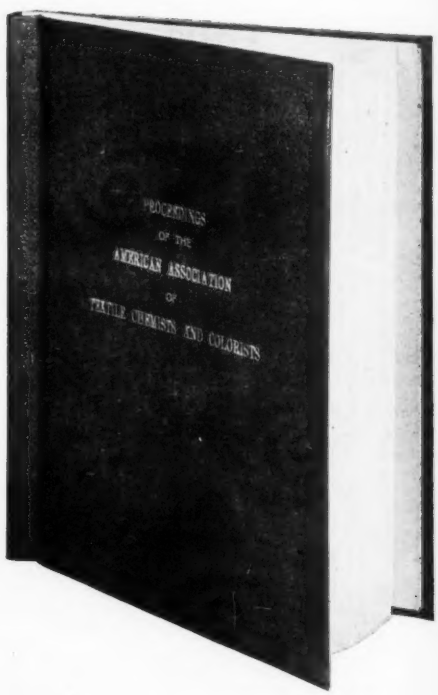

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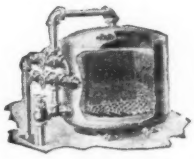

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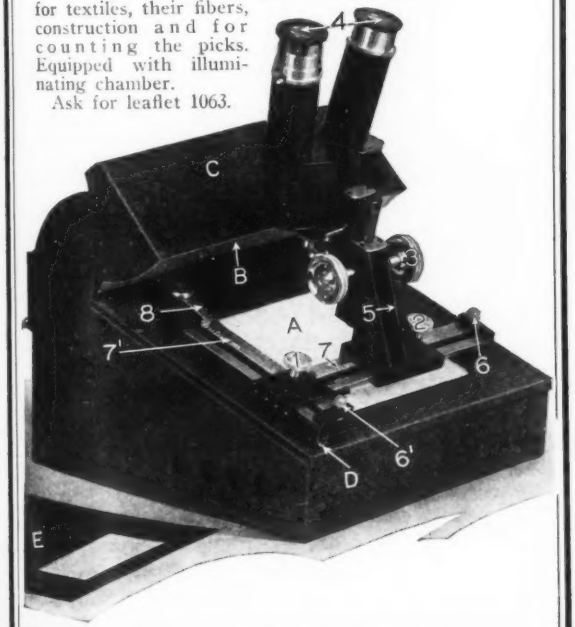

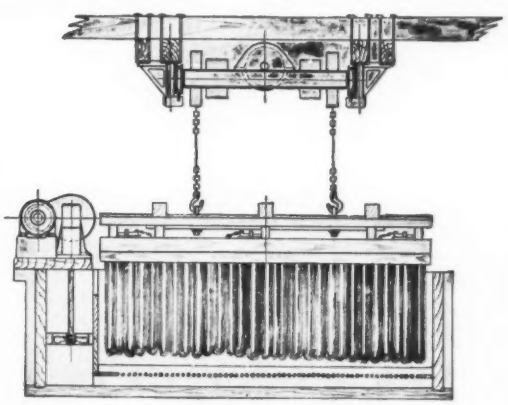

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VOLUME XIV NEW YORK, OCTOBER 5, 1925 NUMBER 17

The Reduction Products of Azo Dyes

By WALTER C. HOLMES

Color Laboratory, Bureau of Chemistry

[EDITOR'S NOTE.—*The most practical and effective method for the identification of azo dyes consists in the isolation and identification of the products which they yield on reduction. This method finds less application than it might or should, partly because some of these products have never been isolated and investigated, and partly because much of the data which has been obtained in regard to such reduction products is greatly scattered and very difficult to locate.*

Mr. Holmes has made a search for all the available information on such reduction products, and in the succeeding numbers of The Reporter there will be published a digest of his results with a systematic listing of the reduction products of the azo dyes, published in the Colour Index, together with the available data on such properties and reactions as would be of service in their identification.]

THE color-reactions of the azo dyes, and their behavior in the tests commonly applied to dyes in general, usually serve merely to indicate that any given dye is one of a considerable number.

Their spectroscopic examination after the scheme of Formanek and Grandmougin (Untersuchung und Nachweis organischer Farbstoffe auf spektroskopischen Wege, 1908, 1911, 1913) proves less decisive than with dyes of many other classes, owing to the greater number of similar individual dyes between which it is necessary to distinguish and to the fact that the absorption bands of azo dyes, in general, are relatively broad and their maxima somewhat poorly defined. The absorption maxima of a considerable number of azo dyes, moreover, have not yet been determined, and the spectroscopic investigation of most yellow dyes necessitates a resort to laborious photographic methods.

It is probable that satisfactory differentiation could be obtained by spectrophotometric methods which utilize not only the absorption of the dyes under ordinary conditions but also the degree in which it is modified under definite and appropriate variations in conditions (Holmes, J. Ind. & Eng. Chem.; 1923, *15*, 833, 1925, *17*, 59). In this method, however, as in any scheme of identification based upon the characteristics of the dyes, as such, each dye requires separate investigation. The considerable labor involved in obtaining the necessary data for any comprehensive application of the spectrophotometric method with azo dyes precludes its consideration.

All azo dyes may be split up into two or more components by either oxidizing or reducing agents, the scission occurring, in either instance, at the azo linkings. The products obtained are the dye-intermediates or simple derivatives of those intermediates. Their identification serves, in turn, to determine the dyes from which they were derived and unquestionably provides the most practicable and advantageous means for the identification of azo dyes. In such methods the number of compounds which require recognition is only a fraction of the number of dyes from which they are obtained. No special equipment is necessary and much of the data which is requisite to the identifications is already available.

In the oxidation method fuming nitric acid has been employed most extensively (Meldola & Morgan, J. Chem. Soc., 1899, *55*, 608; Schmidt, Ber. 1905, *38*, 3201; Rowe & Levin, J. Chem. Soc., 1924, *40*, 218), although Mathewson used bromine water (Bulletin 448, U. S. Dept. Agric.), and a variety of other oxidizing agents are applicable. With nitrous acid the products obtained are diazonium nitrates and nitro compounds.

The oxidation of azo dyes has received less investigation than their reduction and less is known respecting the general course of the reactions and their products. Although the oxidation method may be employed with advantage in specific instances it appears probable that it will be used, in general, to supplement the reduction method rather than to replace it.

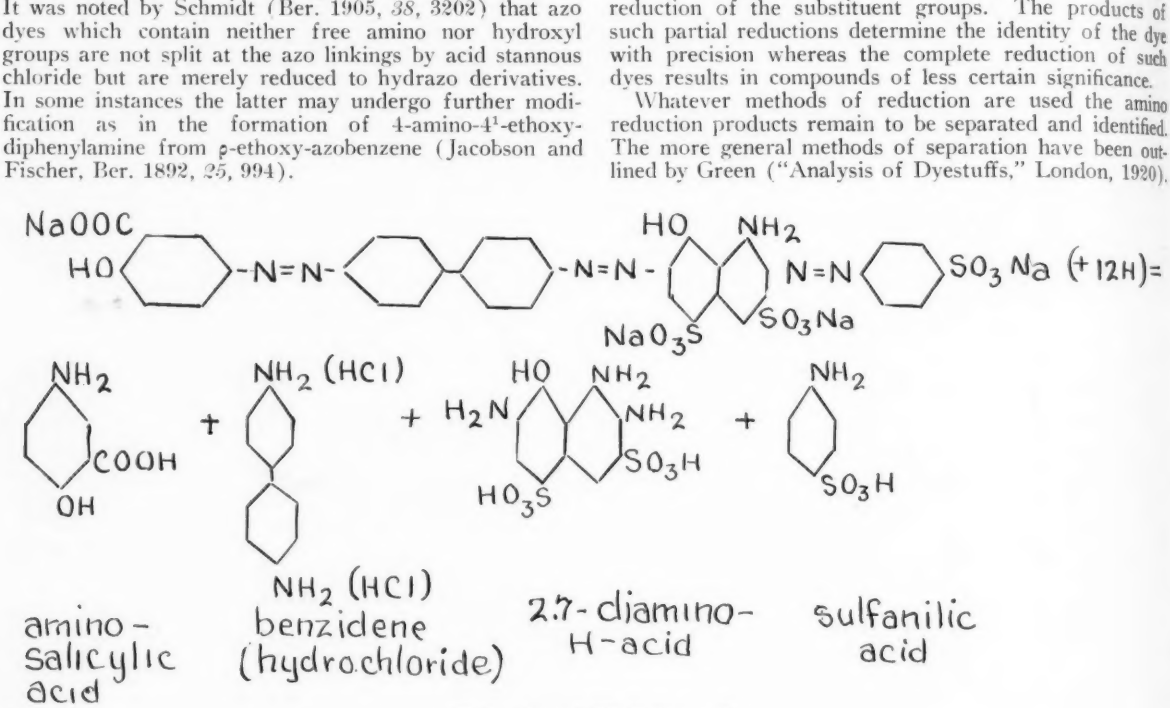
In the complete reduction of azo dyes the molecule is split at each azo linking with the formation of amino groups, and reduction also occurs at all substituent groups (such as nitro groups) in the dye components which are susceptible of reduction. Apart from any such secondary reduction in substituent groups, the reduction products of a monazo dye are the amino compound which was used for diazotization and subsequent coupling and the monoamino derivative of the coupling component. With dyes of a more complex character diamino derivatives of original dye-intermediates may be obtained. Thus the reduction of Eboli Green B (Colour Index No 585) takes place (in acid solution) according to the reaction shown on page 648. (In alkaline reductions the acids

would be obtained in the form of their alkali salts and the benzidine in the form of the base.)

The first application of the reduction method to azo dyes was made by Witt (Ber. 1882, *21*, 3468), who employed a hydrochloric acid solution of stannous chloride. Although many azo dyes are reduced in the normal manner by that reagent certain exceptions have been observed. It was noted by Schmidt (Ber. 1905, *38*, 3202) that azo dyes which contain neither free amino nor hydroxyl groups are not split at the azo linkings by acid stannous chloride but are merely reduced to hydrazo derivatives. In some instances the latter may undergo further modification as in the formation of 4-amino-4¹-ethoxydiphenylamine from p-ethoxy-azobenzene (Jacobson and Fischer, Ber. 1892, *25*, 994).

the reductions should be varied, furthermore, in order to effect all possible variations in the character of the reduction products since such variations have important diagnostic value. In the instance of dyes containing reducible constituent groups it is believed to be feasible to effect the scission of the azo linkings by means of a careful regulation of conditions without entailing the simultaneous reduction of the substituent groups. The products of such partial reductions determine the identity of the dye with precision whereas the complete reduction of such dyes results in compounds of less certain significance.

Whatever methods of reduction are used the amino reduction products remain to be separated and identified. The more general methods of separation have been outlined by Green ("Analysis of Dyestuffs," London, 1920).



Reduction of Eboli Green B

Reduction with sodium hydrosulphite in neutral or alkaline solutions was recommended subsequently by Grandmougin (Ber. 1906, *39*, 2484, 3561, 3929) as a course affording greater convenience in the separation of reduction products. In some instances (as with p-sulphobenzene-azo-anisole) hydrosulphite proves a less effective reducing agent than stannous chloride. With azo dyes containing nitro groups in the ortho position as regards the azo linking derivatives of benztriazole are obtained.

Among other possible reducing agents titanous chloride (Knecht and Hibbert, "New Reduction Methods in Volumetric Analysis") offers certain advantages. So far as is known all azo dyes may be completely broken down into their several components, and all reducible groups in the latter reduced, by the employment of that reagent under favorable conditions. It affords a convenient means, also, of measuring the reduction in quantitative terms. The azo linking requires four hydrogen equivalents in reduction, the nitro group six, etc. The titanous chloride consumption of different azo dyes varies greatly and the determination of that value in the instance of a dye of unknown identity may often be of considerable assistance in its ultimate identification. In this particular application of the method it is obviously necessary to obtain the dyes free from any appreciable amounts of moisture or inorganic salts, but this may be effected readily with most azo dyes.

It is frequently advantageous to employ more than one means of reduction in order to facilitate the isolation of particular components. The methods and conditions of

Identification is based upon the determination of the physical and chemical properties of the amines and upon those of various salts, addition-products and reaction products into which they may be converted readily. The acetyl and benzoyl derivatives are usually characteristic. Among a considerable variety of reagents of somewhat general utility may be cited chloroauric and chloroplatinic acids, picric and picrolonic acids, benzene and naphthalene sulphonic acids and picryl and benzenesulphonyl chlorides. Many additive compounds of arylamines and aryl nitro derivatives are known. (Bibliography by Ludborough, J. Ind. Inst. Sci., 1921, *4*, 159.) Rowe and Levin (J. Soc. Dyers and Col., 1924, *40*, 218) have recorded distinctive data on a considerable number of insoluble azo derivatives of β-naphthol and Naphthol AS which may be utilized in the identification of the separated reduction products of azo dyes (as well as in that of their oxidation products).

In the following lists the more important reduction products of the azo dyes are recorded in constitutional sequence together with such data as the writer has been able to obtain as appear to have probable utility for their identification. Much of the available information respecting these compounds is so scattered and difficult to locate that the record is doubtless incomplete, but the same circumstance warrants the belief that even an imperfect digest of the material will be of considerable service to those who may have occasion to employ the reduction method with azo dyes. In some instances compounds are listed without data or with meager informa-

tion which is entirely inadequate for their identification. By calling attention to the necessity for the investigation of such compounds it is hoped that the interest of the analyst may be aroused in supplying the data which are needed in order to make possible the comprehensive application of the method.

The lists are intended to cover the reduction products of the nitroso, nitro, azo, stilbene and pyrazolone coloring matters listed in the Colour Index (Society of Dyers and Colourists) with the exception of such of those dyes dyes as are of uncertain constitution. The compounds listed include those derived from the dyes by complete reduction, together with such as would result from a reduction of dyes containing reducible constituents in their components if the reduction were regulated in such manner as to be confined to the azo linkings alone.

In order to conserve space author's names are omitted and literature references are cited only if it appears necessary or advisable that the original sources be consulted.

No. 1: ANILINE

C_6H_7N; Mol. Wt. 93.09; (C, 77.4%; H, 7.6%; N, 15.0%). Derived from: C. I. Nos. 15, 19-35, 232, 237, 243-255, 267, 271, 288, 321, 324, 324A, 327, 531, 533, 535, 536, 581-584, 624, 636, 637.

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Monoacetyl deriv., (acetanilide), Mpt. 114.3° cor. Bpt. 170° at 11 mm., 226-7° at 100 m.., 305° cor. at 760 mm. 100 cc. H_2O dissolve .54 gm. at 25°, 100 cc. alc. 46.7 gm. Gives phenylglycine with chloracetic acid (heat), colorless cryst. mpt. 127°.

Diacetyl deriv., Glistening plates, readily sol. in C_6H_6, toluene and ligroin, sl. sol. in cold H_2O. Mpt. 37-37.5°. Bpt. 142° at 11 mm., 199-200° at 100°.

Benzoyl deriv., Mpt. 163°; *dibenzoyl* deriv., Mpt. 160-1°.

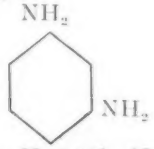
Hydrochloride: very sol. gray monocl. needles, mpt. 198°, bpt. 245° (decomp.). *Picrate;* transp. cryst.; darken at 165° (decomp.). H_2O dissolves .45% at 17.5°, alc. (95%) dissolves 8.4%. *Oxalate,* mpt. 161-2°. *Tartrate:* mpt. 191° cor. (decomp.); acid tartrate; mpt. 187-8° cor. (decomp.). *Benzoate;* long colorless silky needles (light petroleum), mpt. 90°. (For characteristic substituted benzoates, see J. Chem. Soc., 75, 580.)

Benzene sulfonate; mpt. 240°. 11.3% sol. in H_2O at 19°. *α-Naphthalenesulfonate;* mpt. 183°, 1.58% sol. in H_2O at 15°. *β-Naphthalenesulfonate;* mpt. 269°, .52% sol. in H_2O at 15°. *2, 6-Naphthalenedisulfonate;* mpt. 251-2°, 3.9% sol. in H_2O at 15°. *2, 7-Naphthalenedisulfonate;* mpt. > 345°, .82% sol. in H_2O at 15°. *α-Anthraquinone sulfonate;* needles, mpt. 284°. *β-Anthraquinone sulfonate;* needles, mpt. 309°, sol. in 1,700 pts. H_2O.

Additive comp.—with *trinitrobenzene (sym.)* glittering red leaflets, mod. sol. in warm C_6H_6, mpt. 123-4°; with *picramide,* glittering dark red cryst., mpt. 123-5°; with *α-trinitrotoluene,* long glistening red needles, mpt. 83-4°; with *tetryl,* orange red plates (C_6H_6), mpt. 64°; with *2, 4, 6-trinitrobenzaldehyde,* red plates (alc.), mpt. 86°; with *2, 4, 6-trinitrostilbene,* orange-red leaflets, mpt. 103-5°; with *2, 6-dinitrohydroquinone,* dark red needles, mpt. 102-3° (decomp.).

Condensation prod:—with *α-halogen-β-naphthol,* 1-phenylamino-2-hydroxy naphthalene, mpt. 155-6°, (methyether, mpt. 82-3°); with excess *benzene-sulfonyl chloride,* dibenzolsulfonanilide, mpt. 128-9°; with *tetranitraniline,* 2, 4, 6-trinitro-3-aminodiphenylamine, orange yellow, mpt. 188°; with *1-chlor-2, 4-dinitro benzene,* 2, 4-dinitrodiphenylamine, mpt. 155-6°; with 1-brom-3, 4, 6-trinitrobenzene, 5-brom-2, 4-dinitrodiphenylamine, garnet-red prisms, mpt. 156°; with *tetryl,* 2, 4, 6-trinitrodiphenylamine, mpt. 178°; with *2, 4, 6-trinitrobenzaldehyde,* 2, 4, 6-trinitrobenzalaniline, yellow cryst. mpt. 220° (decomp.).

Diazotized and coupled with;—*β-naphthol,* red needles, mpt. 131° C., red sol. in H_2SO_4, orange pptte. on dil.; —*Naphthol AS,* minute red needles (HOAc), mpt 237°, red sol. in H_2SO_4, red pptte. on dil.;—*1-Naphthol-2-sulf. acid,* abs. data, J. Assoc. Off. Agric. Chem. 6, 16. With bleaching-powder sol. and dil. $(NH_4)_2S$ aniline gives a blue color, turning violet and then fading.



No. 2: m-PHENYLENEDIAMINE

$C_6H_8N_2$; Mol. Wt. 108.11; (C, 66.6%; H, 7.5%; N, 25.9%). Derived from; C. I. Nos. 331, 542, 543, 606-609 and by the complete reduction of 36-39.

Dimorphic; α-form (above 36°), brown needles, β-form (below 36°) mauve plates. May be "frozen out" of 40% sol. at 0° in beautiful white prisms ($+\frac{1}{2}H_2O$). Readily sol. in H_2O and org. solv. Mpt. 62.8°. Bpt. 282-4° (287°, Green). May be distilled in vacuo.

Monoacetyl deriv.: Flat needles or long, thin plates (from C_6H_6 in which it dissolves with difficulty). Readily sol. in H_2O, alc. and acetone. Mpt. 86.5-87.5° (cor.). The hydrochloride, transp. plates (alc.). Mpt. 248-51°. Readily diazotized. *Diacetyl (N, N¹) deriv.:* mpt. 191°, prisms (alc.). *m-Chloracetylamino acetanilide:* radiating delicate cryst (alc.), mpt. 212-14°.

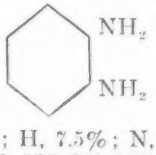
Benzene sulfonate: mpt. > 320°, .19% sol. in H_2O at 17°.

B-naphthalene sulfonate: mpt. 275°, 1.27% sol. in H_2O at 17°.

Hexabromoplatinate: dark red glittering rhombic needles, mpt. > 270°.

Additive comp.:—with *1, 3, 5-trinitronaphthalene,* brown needles (alc. and C_6H_6), mpt. 170°; with *tetryl,* silky brown needles (C_6H_6), mpt. 84°.

Condensation prod.:—with *γ-trinitrotoluene,* 2, 4-dinitro-5-methyl-3¹-aminodiphenylamine, red yellow, mpt. 160-1° (acetyl deriv., red yellow, mpt. 244-5°); with α-dinitrochlorbenzene, mpt. 172°; with *tetryl,* 2, 4, 6-trinitro-3¹-aminodiphenylamine, deep red cryst., mpt. 207°. Acet-m-phenelenediamine with antipyrin chloride gives 2, 5-aminoanilopyrine, mpt. 45-50° (hydrochloride, mpt. 260° (decomp.); acetyl deriv., mpt. 212°; benzoyl deriv., mpt. 172°); m-phenylenediamine gives an orange-red or orange-brown color with acid solutions of nitrites.



No. 3: p-PHENYLENEDIAMINE

$C_6H_8N_2$; Mol. Wt. 108.11; (C. 66.6%; H, 7.5%; N, 25.9%). Derived from: C. I. Nos. 15, 53, 230, 247-255, 265, 268-270, 273-278, 297, 338-342, 540, 595 619, 625, 627-629 and by complete reduction from 40-50, 238, 244, 592-594.

Monoclin. cryst. Mpt. 140-147°. Bpt. 267°. Mod. sol. in H_2O.

Acetyl deriv., long needles (H_2O), mpt. 162° cor. *Diacetyl deriv.*, yellow-green cryst, mpt. 160°. *p-Chloracetylamino acetanilide*, minute prisms (HOAc), darkens above 260°, decomp. 265-270°.

Dibenzoyl derivative, mpt. 222°.

Benzenesulfonate, mpt. > 320°, 2.57% sol. in H_2O at 10°; *α-naphthalene sulfonate*, mpt. > 330°, .26% sol. in H_2O at 10°; *β-naphthalene sulfonate*, mpt. > 330°, .07% sol. in H_2O at 15°.

Condensation prod., with *y-trinitrotoluene* gives 2, 4-dinitro-5-methyl-4'-aminodiphenylamine, garnet-red, mpt. 174-5° (acetyl deriv., orange, mpt. 222-3°); with *benzophenone* (with $ZnCl_2$) gives bis-diphenylmethylene-p-phenylenediamine, gold-yellow plates (alc.), mpt. 180°; with *bromonitro-styrene* gives dibenzylidene-p-phenylenediamine, irregular plates, mpt. 138-40°; cond. prod. with *succinic anhydride* colorless glittering needles, mpt. 262°.

Oxidation prod. See Ber. *27*, 480; *37*, 2776, 2906. Oxidized in presence of aniline or o-toluidine it yields blue indamines. Oxidized ($FeCl_3$) in presence of H_2S it yields Lauth's Violet. With alkaline hypochlorite obtain quant. conversion into insol. (white) benzoquinone dichlorimide.

Conversion to meriquinonediimonium bromide (with bromine in alc. and glac. HOAC) yields micr. flat cryst. which dissolve in alc. with a greenish-yellow sol. which turns blue at —20°.

(*Additional data will appear in an early issue*)

The Bleaching of Artificial Silk Waste

Four Classes of Artificial Silk Waste—Character of Injury Sustained—Treatment for First Class—Bleaching —After-Treatment—Viscose Silk—Treatment for Third Class—Treatment for Fourth Class of Waste

By WALTER KOSCHE

(*Deutsche Faerber Zeitung*, 1925, 167)

Translated by Ismar Ginsberg, B.Sc., Chem. Eng.

THE artificial silk waste, which is accumulated in the manufacture of artificial silk as well as in the weaving and spinning of the silk, must be worked up and utilized for some purpose if the process is to be carried out under the proper economic conditions. The process which is employed for working up this waste depends on the character of the waste itself, whether it has been finished or not. Thus, where the waste is composed of silk that has been put throught the finishing process, the task is first to remove the impurities which contaminate it and then to bleach it, so as to obtain a product of the proper luster and handle.

This is a task which is not always easy to accomplish, and which is rendered still more difficult by the fact that the character of the artificial silk waste differs very greatly because of the different processes employed in its manufacture, because of the different ways in which it has been finished and finally because of the variety of impurities, such as dust, machine oil and the like that it is apt to contain. The artificial silk waste may be divided into four classes according to its character, and in this connection the way in which it has been finished is also taken into account.

Four Classes of Artificial Silk Waste

In the first class there is found all the waste silk which is obtained from the manufacturers of the product. This does not include viscose silk. The latter forms the second class. The waste in the third class consists of the material obtained from the manufacturing processes in spinning and weaving, while the fourth class includes the sweepings that are collected in the spinning and weaving mills as well as the silk that has been used for polishing purposes.

In general a finishing or bleaching process consists of three distinct phases. First there is the preliminary treatment of the yarn or fabric, then the bleaching proper, which is finally followed by the after-treatment. The artificial silk waste which is to be put through the finishing process is first pulled apart, that is, the packages of the material are opened up, so that a mass of fibers is obtained in loose form. This pulling-apart process allows all the mechanical impurities, such as dust, glass, wood, particles of iron and other substances of little value to be completely removed.

After the artificial silk waste has been put through this preliminary treatment it is filled into the bleaching kier. The kier is loaded with half the weight of silken waste that it can conveniently hold, its capacity being considered as unity in the case of cotton. Thus the weight of the silk charge is half of that of the cotton charge that the kier can hold. In the case where material is being treated which is particularly stubborn, it is customary to fill the kier with a little less than half of its capacity for cotton. In this manner too tight packing of the silken materials in the kier is avoided.

This precaution must be kept in mind, particularly when material of tough character is being bleached. The artificial silk waste is then covered with a latticework cover which is loaded down suitably so that a certain amount of pressure is applied to the material. The waste is given only a single bleaching treatment, for further treatment with the bleach liquor will injure the fibers, which is manifested in the dusting of the finished and dried fabric.

Character of Injury Sustained

The injury sustained by the artificial silk waste when subjected to too long or repeated bleaching is caused by the long contact with water, for it is a fact that when artificial silk is allowed to remain for too long a time in contact with water it loses its keeping qualities and becomes tender. Another factor is the chemical bleach, hypochlorite of lime, which also has an injurious action on the artificial silk fiber.

But when the silken waste is given a direct and single bleach with a solution of sodium hypochlorite, the results are never satisfactory, and thus it becomes necessary to subject the silken fibers to a preliminary process shortly before the material is packed into the bleaching kier. It is also usual to make a small test with the silken waste to determine whether or not the process through which it is intended to put the waste will give the desired results without injurying the fibers in any way.

Treating the First Class of Artificial Silk Waste

The artificial silk waste which comprises the first class, as described above, is material which possesses the characteristic artificial silken luster and which is entirely free from impurities. While in many cases this class of silken waste is reworked in the state that it is recovered, nevertheless, it forms a very desirable commercial product, which when bleached is exported from the country. The production of a faultless white on this material is a rather difficult matter, particularly when the capillary fibers are of tough character.

The silk which is placed in the kier is first treated with a solution comprising 1½ per cent of sodium perborate and 1 per cent of commercial sodium hydroxide or with a 1½ per cent solution of water glass (sodium silicate). The treatment lasts for two hours and the temperature is maintained at 60 deg. Cent. In the last half hour of the treatment the temperature is made to rise to 70 deg. Cent., in order to be able to utilize the oxidizing action of the last traces of oxygen present in the liquor. The kier is most advantageously operated with a continuously working injector and circulating pump. Thereafter the material in the kier is washed for half an hour. It must be borne in mind that the water used in the process must be perfectly clean, clear and cold. If other water is used, then the time consumed in the washing operation is greater.

The Bleaching Proper

This preliminary treatment is followed by the bleaching process proper. For this purpose there is used a solution of hypochlorite, which is brought beforehand to the normal temperature, 17 deg. Cent., and which contains from 2.6 to 2.8 grams of active chlorine per liter. The duration of the bleaching varies in accordance with the toughness and strength of the artificial silk fiber and can last from eight to ten hours. Thereafter the silken materials are washed, then soured and treated for half an hour with a 4 per cent solution of hydrochloric acid. Then it is washed again until the outflowing water no longer gives an acid reaction with blue litmus paper. The residual bleach liquor must under no circumstances be thrown away, but for economical reasons it must be pumped back into tanks and used over again in the process. This makes it necessary to test the bleach liquor often to see that it contains the correct amount of bleaching agent which is a process that is familiar to the plant man and which when carried out in the proper fashion and at the right time avoids trouble in the bleaching process.

Treating the Goods After Bleaching

The bleached materials which are now removed from the kettle are treated in a tub. The tub is in reality a tank provided with an easily removable perforated false bottom. The purpose of the perforated false bottom is to prevent particles of artificial silk being carried along by the process liquors and their stuffing valves and the like. The tanks are loaded to capacity with the bleached silken fibers. The waste artificial silk fibers which belong to the first class, mentioned above, are subjected to three washings with cold water. In most cases it is then unnecessary to subject the silk to any brightening process, but if necessary the silk is passed through a lukewarm solution of Monopole soap and then centrifuged without first being washed. The silken waste is then dried, most advantageously at a temperature between 45 and 50 deg. Cent. Care should be taken to see that the cooling process is carried out correctly, as if it is not, the material will take on a glassy, fatty appearance which is not desirable.

Viscose Silk

The artificial silk which is made in accordance with the viscose process differs very markedly even in appearances from the silk of the first class. While the last named artificial silk possesses the characteristic luster of this class of textile, the viscose silk has a dull appearance. The ignition of a few threads of the viscose silk indicates the presence of sulphur in the original by the characteristic sulphur dioxide odor. The method which has just been described cannot be used to bleach this kind of silk.

It is advantageous first to remove the sulphur that is present in this kind of artificial silk. This is best accomplished with the aid of solutions of chemicals which evolve sulphurous acid when dissolved in water. Such chemicals as bisulphites, and combinations of hydrosulphurous acid, such as the hydrosulphites, dekrolein, blankite, etc. This class of artificial silk waste is treated with a 3 per cent bisulphite or a 1 per cent hydrosulphite solution for a period of two hours at a temperature of 90 deg. Cent. Then the silk is washed with water, bleached, soured and thereafter washed once again, just as is described above.

The artificial silk, after it has been bleached, will show a greater or lesser number of rust spots. These spots are due to the use of iron-containing technical chemicals in the manufacture of viscose silk. Rust spots are also formed at those spots where mechanical impurities of one sort or another were exposed to the action of the bleach liquor. The removal of the rust spots is accomplished by giving the material two washings in cold water, which is then followed by a wash with oxalic acid in the washing tank. The concentration of the oxalic acid varies in accordance with the intensity of the color of the spots.

In most cases it is necessary to brighten this class of artificial silk waste after the bleaching process. This is accomplished in the following manner: The silken material is treated with a solution of oxalic acid, which has been cooled down to a temperature of 40 deg. Cent. The oxalic acid solution is mixed with from 2½ to 3 per cent of olive oil, from 3 to 5 per cent of gelatine and from 7 to 8 per cent of acetic acid. The treatment lasts twenty minutes, and then the cloth or fibers are centrifuged without preliminary washing, and thereafter dried. Traces of oxalic acid in the free state which are held back by the fibers are not harmful to the artificial silk. This fiber is resistant to this non-volatile organic acid in the same manner as the cotton fiber.

Treating the Artificial Silk Waste of the Third Class

The artificial silk waste which comprises the third class contains wastes that are obtained from spinning and weaving mills. This waste is composed of bleached and raw silk, which may or may not be mixed with colored fibers. In the preliminary opening-up process it is necessary to separate the raw and bleached material. The colored fibers need not be removed at this point for they do not disturb the subsequent operation in any way; they are more advantageously removed after the bleaching process. During this process many non-fast coloring matters are destroyed by the chlorine. While the raw fibers may be treated with the bleach liquor, without any preliminary processing, according to the instructions described above, considerable care must be taken in the treatment of the silken fibers which have already gone through a bleaching process. This part of the silken wastes are treated as described above, but the chlorine-treatment must be shortened to a period varying between three to six hours according to the degree of bleaching that the fibers have undergone in the first place. The concentration of the bleach liquor in active chlorine is maintained at from 2 to 2½ grams of chlorine per liter.

Treating Artificial Silk Waste of the Fourth Class

The treatment of the artificial silk waste that belongs to the fourth class, as described above, is in general a disagreeable and dirty task. It is fortunate, therefore, that the quantity of this kind of artificial silk waste that is recovered for treatment is small. Thus the dust that is removed from this kind of silken waste in the opening-up process has a very sharp action at times on the membranes of the nose, eyes and throat as well as on the skin of the hands and arms. It is therefore necessary that the laborers who work on such materials be properly protected against their action.

The bleaching of this kind of artificial silk is most difficult of all the various kinds of artificial silk wastes that are recovered for treatment. However, in spite of the considerable proportions of different impurities that are contained by this product, good results are obtained which will undergo examination by the sharp eye of the textile finisher and dyer.

The treatment consists in subjecting the silk waste to a two to three hours' treatment in a bleaching kier with a solution composed of 3 per cent of calcined sodium carbonate, 1½ per cent of soap, and from 3 to 5 per cent of verapol or any other fat solvent. The treatment is carried out almost at the boiling temperature of the solution. The solution is pumped back and forth in constant circulation through the kier from a heater which is located exterior to the kier. This is accomplished with the aid of a pump and injector, as far as the former will work at these high temperatures.

An important consideration in all these operations is the temperature; too high a temperature will be very apt to injure the silken fibers and too low will not give the results that are expected of the process. It is, of course, possible to effect temperature regulation by hand, but this at best is an uncertain and laborious task. It appears best to employ an automatic temperature regulator which consists in general of a regulating bulb and a device which closes and opens the steam valve. The bulb is inserted in the liquor whose temperature it is desired to regulate while the valve control device is located on the steam line. A connection between the bulb and the regulator proper actuates the valve, either closing it when the temperature gets too high or opening it when it gets too low. Automatic regulation which is secured in this manner makes it possible to secure the best results from the process.

Thereafter the artificial silk waste is washed and bleached as described above. But after the bleaching it is seldom that a fine white color is obtained but rather a grayish white effect. The mineral oil which is mixed with the original artificial silk waste has not been removed, although it has been dissolved. Hence when the silk is washed further the oil is thrown down again on the fibers as mechanically held impurities. Washing the silk in running water or in a suitable washing machine gives a fabric of pure whiteness which can be used for numerous purposes. The whiteness of the fabric can be enhanced materially, if the material after being put through the preliminary treatment is cleansed of the precipitated mineral oil and then bleached. Chlorine is the bleaching agent that is employed in the process.

Dyeing Acetate Silk

Part XV

(*Continued from page 627*)

Acetate Silk Dyes with Animal Fibers—Neolan Dyes on Acetate Silk Effects—Woolen Goods with Acetate Silk Effects—Methods of Dyeing and Suitable Colors—Cotton and Wool Unions Containing Acetate Silk Effects—Formulas and Dyes Used.

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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TO leave the acetate silk white in acetate silk-cotton-real silk unions, the silk should be dyed with acid dyes and acetic acid. Rinse well and neutralize the goods with sodium bicarbonate. They dye the cotton with suitable direct cotton dyes. This method may be reversed when a direct dye which does not stain silk is to be used. Some direct dyes such as Chrysophenine and Benzo Purpurin give almost the same shade on both the natural silk and cotton, in which case the same dye bath will answer for both fibers.

Wool and acetate silk unions are more difficult to handle than the cotton unions, for while it is not difficult to find wool dyes which do not stain acetate silk, most of the acetate silk dyes stain or dye wool, and usually they dye the wool a different color from that of the silk. As previously mentioned, the Ionamines dye wool as acid dyes and hydrolyze to dye the acetate silk, giving entirely different shades. Upon diazotization and development the difference becomes even more accentuated.

Most of the acid dyes also give different shades on acetate silk and wool; for instance, Citronine Y Conc. gives a greenish yellow on acetate silk and a reddish yellow on wool; Cardinal Red J gives a pink on acetate silk and a full red on the wool. Magenta and Malachite Green, both basic dyes, give approximately the same shade on acetate silk and wool but the wool is dyed a deeper shade, while Tannin Pink C leaves the acetate silk white in wool unions.

Some of the SRA and similar "dispersal" dyes give approximately the same color on both the acetate silk and wool; however, the acetate silk is usually a much deeper shade. By proper manipulation of the acidity and temperature, or by adding suitable acid dyes to the dye bath, it is sometimes possible to get solid shades from dispersal dye baths.

In this connection the following wool dyes may be recommended. It will be noticed that most of these dyes are also "CR" or, in other words, do not stain acetate silk. Those marked (*) are particularly recommended for low temperature application:

*CR Coomassie Blue Black G Conc.
CR Coomassie Carmine 2GD and 2BD.
CR Coomassie Acid Blue R.
CR Coomassie Violet 10BP.
*Alizarine Delphinol BS Special.
Acid Green 2G Conc.
*Disulphine Blue.
Orange G.
*Orange II Conc.
Tartarozine R Extra Conc.
CR Wool Blue V.
CR Wool Green V.
CR Wool Light Yellow 2G.
CR Wool Fast Pink B.
CR Wool Red 5B.
CR Wool Fast Blue R.
CR Wool Blue SAP.
CR Wool Crystal Orange.
CR Wool Yellow T.
CR Wool Blue A.
CR Wool Green 2G.
CR Wool Black 10B.
CR Wool Black 10BW.
CR Wool Violet 10B.

Neolan Dyes on Acetate Silk Effects

The Neolan dyes are a new class of wool dyestuffs which are stated to be water soluble dye salts of metals, usually chromium. Most of these dyes leave acetate silk white or only slightly stained. The Neolan dyes are applied to wool in an acid bath with sulphuric acid, using rather more than the usual amount of acid. It is possible that some of these dyes are applicable with organic acids only, in which case they would be more suitable for use in the presence of acetate silk, but no doubt considerable acid would be required.

The new "soluble vat" dyes, such as Indigosol O, Indigosol O4B and Soledon Jade Green should be particularly adapted to give fast shades on acetate silk unions. These dyes may be applied in nearly neutral baths as described by the author in the "Textile Colorist" of January, February and September, 1925, respectively.

Woolen Goods with Acetate Silk Effects*

In dyeing for acetate silk effects, usually only a thread effect is desired, and if the acetate silk is to be colored, it is usually dyed before making up the fabric. While this previous dyeing is not always necessary, especially in the case of cotton, it is usually very desirable in the case of materials containing wool, so as to avoid staining the wool with the acetate silk dyes. As before stated, it is not at all difficult to find wool dyes which do not stain acetate silk, but usually it is desirable to use wool dyes which are applicable at low temperatures. The following formulas are given as suggestions of formulas which appear to give good results by Method No. 100, which follows:

Formula No. K-1—Brown.
0.47 per cent Alizarine Cyanole ZEF,
0.70 per cent Fast Acid Yellow TL and
0.15 per cent Brilliant Lanafuchsine GG.

Formula No. K-2—Darker than K-1.
0.62 per cent Alizarine Cyanole ZEF,
0.70 per cent Fast Acid Yellow TL and
0.30 per cent Brilliant Lanafuchsine GG.

Formula No. K-3—Darker than K-2.
1.40 per cent Alizarine Cyanole ZEF,
2.40 per cent Fast Acid Yellow TL,
0.25 per cent Brilliant Lanafuchsine GG, and
1.80 per cent Orange GG.

Formula No. K-4—Red.
1.80 per cent Azo Wool Violet 7R,
4.50 per cent Brilliant Lanafuchsine GG, and
0.20 per cent Orange GG.

Formula No. K-5—Blue.
4.75 per cent Azo Fast Blue BD.

Formula No. K-6—Black.
7.50 per cent Naphthylamine Black EFF.

Method No. 100: Dyeing Woolen Materials Containing Acetate Silk Effects.—Dye with the addition of 1 per cent of sodium sulphate crystals and 10 to 15 per cent of sodium acid sulphate, or 20 per cent of sodium sulphate and 2 to 6 per cent of sulphuric acid, boiling for one to one and a half hours.

The following wool dyes are of interest in connection with woolen fabrics containing acetate silk effects:

Normal Fastness to Light

Acid Yellow AT.
Fast Yellow S.
Brilliant Cochineal 2R and 4R.
Lanafuchsine SG, SB and 6B.
Azo Wool Violet 7R.
Cyanole FF and extra.
Cyanole Green B and S.
Cyanole Fast Green G and GG.
Brilliant Naphthol Blue, all brands.
Azo Wool Blue SE and SER.
Azo Fast Blue, all brands.
Naphthylamine Black EFF.

Excellent Fastness to Light

Fast Acid Yellow TL and 3G.
Orange GG.
Brilliant Lanafuchsine GG, SL and BB.
Alizarine Cyanole Red B.
Alizarine Cyanole B.
Alizarine Cyanole Green Blue B.
Alizarine Brilliant Green G.
Lanacyl Blue RN and BN (for dark blues).
Peri Wool Blue B and G (for dark blues).
Naphthol Black 6B, 3B, B and P.

Good Fastness to Light and Perspiration

Radio Yellow R.
Radio Red G and VB.
Radio Brown B.
Alizarine Cyanole Green Blue B.

Afterchrome Dyes of Excellent Fastness

Anthracene Yellow BN.
Anthracene Chrome Red A and B.
Anthracene Chrome Violet B.
Anthracene Chrome Blue R and F.
Anthracene Blue Black BE, for light and medium shades.
Azo Chrome Blue T and TB.
Anthracene Acid Black SR and ST.
Anthracene Chrome Black PPN extra.

The following acid dyes stain acetate silk rather more than the cotton but are sometimes useful:

Tropaeoline O.
Orange FN, R, Extra, and A Extra.
Brilliant Scarlet G and GG.
Croceine AZ.
Brilliant Croceine M, MOO, 3B and 5B.
Naphthol Red C.
Brilliant Milling Red R.
Milling Red B.
Azo Orseille KWS.
Formyl Violet 4BF and S4B.
Acid Violet 6BS.
Thiocarmine R.
Brilliant Milling Blue B and FF.
Alizarine Cyanole SB and SBR.
Brilliant Milling Green B.

The following acid dyes are not suited for use on woolen goods with unstained acetate silk effects:

Indian Yellow, especially G and R brands.
Tropaeoline OO.

*The author is indebted to George H. Alpers, of the General Dyestuff Corporation, for much data upon dyeing wool and union materials with acetate silk effects.

Orange IV.
Roccelline.
Acid Violet 6BC.
Alizarine Leveling Violet BR.
Alizarine Cyanole EF and BE.
Alkali Blue, all brands.
Alphanol Brown R.
Alphanol Fast Gray B.
Anthracite Black B.
Naphthylamine Black 4B, D, HWN, S, T, TJ, TN and SS2B.
Naphthylamine Blue Black B and 5B.
Hat Black, all brands.

Cotton and Wool Union Materials Containing Acetate Silk Effects

In dyeing wool-cotton unions containing acetate silk white or previously dyed effects, either the one or two dye bath method may be used. Of course, the two-bath method is usually the most satisfactory. A number of methods may be used for either the one or two bath process similar to those used on cotton-wool unions without the acetate silk effects, but for the formulas given below, Methods No. 101, No. 102, No. 103 and No. 104 are recommended. In some instances the colors were dyed on gray stock, i. e., Formulas No. L-1 to L-14.

Formula No. L-1—Grayish Blue, Method No. 101.
2.00 per cent Diamine Black RMW,
0.10 per cent Diamine Brilliant Orange SS,
0.70 per cent Croceine AZ, and
0.35 per cent Naphthol Blue G.

Formula No. L-2—Brown, Method No. 101.
1.50 per cent Diamine Yellow CP,
1.50 per cent Diamine Fast Yellow FF,
2.50 per cent Diamine Black BH,
0.80 per cent Naphthol Blue G and
0.50 per cent Tetra Cyanole A.

Formula No. L-3—Brown, Method No. 101.
1.50 per cent Diamine Yellow CP,
0.50 per cent Diamine Fast Yellow FF,
1.80 per cent Diamine Brilliant Orange SS,
1.80 per cent Diamine Black BH,
0.5 per cent Tetra Cyanole A and
0.40 per cent Brilliant Milling Red R.

Formula No. L-4—Blue, Method No. 101.
4.50 per cent Diamine Black BH,
2.00 per cent Lanacyl Blue BN and
0.50 percent Formyl Violet S4B.

Formula No. L-5—Black, Method No. 101.
7 per cent Black VA.

Formula No. L-6—Grayish Blue, Method No. 102.
0.25 per cent Cyanole Fast Green G and
0.23 per cent Lanafuchsine SG.
*700 grains Diamine Black RMW and
*70 grains Diamine Orange D.
*Per 100 gallons of bath.

Formula No. L-7—Brown, Method No. 102.
3.50 per cent Cyanole Green G,
0.80 per cent Acid Yellow AT and
0.20 per cent Lanafuchsine SG.
*490 grains Diamine Yellow CP and
*1400 grains Diamine Black BH.
*Per 10 gallons of bath.

Formula No. L-8—Brown, Method No. 102.
0.30 per cent Cyanole Fast Green G,
1.75 per cent Acid Yellow AT and
*1400 grains Diamine Black RMW and
*560 grains Diamine Fast Brown GF.
*Per 10 gallons of bath.

Formula No. L-9—Blue, Method No. 102.
2.00 per cent Brilliant Naphthol B and
0.50 per cent Brilliant Milling Blue B.
*350 grains Diamine Black RWM and
*2100 grains Diamine Black BH.
*Per 10 gallons of bath.

Formula No. L-10—Black, Method No. 104.
1.00 per cent Para Diamine Black FFB Extra conc.
3.00 per cent Naphthylamine Black EFF.

Formula No. L-11—Blue, Method No. 102.
0.50 per cent Cyanole Fast Green G and
0.45 per cent Acid Yellow AT.
*700 grains Diamine Sky Blue FF and
*70 grains Diamine Fast Yellow AGG.
*Per 10 gallons of bath.

Formula No. L-12—Blue, Method No. 102.
0.40 per cent Cyanole Fast Green G,
0.10 per cent Lanafuchsine SG and
0.08 per cent Azo Wool Violet 7R.
*1050 grains Diamine Black BH and
*315 grains Diamine Fast Yellow A.
*Per 10 gallons of bath.

Formula No. L-13—Darker Blue, Method No. 102.
0.50 per cent Lanafuchsine SG,
1.00 per cent Azo Wool Violet 7R,
0.20 per cent Fast Acid Yellow TLN and
0.70 per cent Cyanole Fast Green G.
*1050 grains Diamine Heliotrope B,
*875 grains Diamine Black BH and
*175 grains Diamine Fast Yellow A.
*Per 10 gallons of bath.

Formula No. L-14—Brown, Method No. 102.
0.38 per cent Cyanole Fast Green G,
0.90 per cent Acid Yellow AT and
2.20 per cent Lanafuchsine SG.
*1750 grains Diamine Black BH.
*1400 grains Diamine Fast Brown CF and
*140 grains Diamine Fast Red 8BL.
*Per 10 gallons of bath.

Formula No. L-15—Light Blue, Method No. 102.
0.05 per cent Cyanole Fast Green G,
0.20 per cent Alizarine Cyanole ZEF and
0.02 per cent Fast Acid Yellow TL.
*70 grains Diamine Sky Blue FF and
*35 grains Diamine Green HS.
*Per 10 gallons of bath.

Formula No. L-16—Green, Method No. 102.
0.40 per cent Alizarine Cyanole ZEF,
1.50 per cent Fast Acid Yellow TL and
0.40 per cent Brilliant Lanafuchsine GG.
*210 grains Diamine Sky Blue FF,
*1050 grains Diamine Fast Yellow A and
*105 grains Diamine Orange D.
*Per 10 gallons of bath.

Formula No. L-17—Red, Method No. 103.
6 per cent Diamine Azo Bordeaux R diazotized and developed with *B*-naphthol.
1.75 per cent Lanafuchsine 6B and
1.00 per cent Milling Red FR.

Formula No. L-18—Blue, Method No. 103.
6 per cent Diamine Black BH diazotized and developed with *B*-Naphthol.
2.50 per cent Azo Fast Blue B.

Formula No. L-19—Dark Brown, Method No. 103.
8 per cent Diamine Black RMW diazotized and developed with Resorcinol.
0.25 per cent Tetra Cyanole A,
1.80 per cent Radio Yellow R and
0.25 per cent Radio Red G.

Formula No. L-20—Black, Method No. 103.
8 per cent Diamine Black RMW diazotized and developed with *B*-Naphthol.
5 per cent Alphanol Black 3BN.

Formula No. L-21—Orange-Yellow, Method No. 101.
0.05 per cent Diamine Fast Blue FFB,
0.18 per cent Diamine Fast Brown GF,
0.60 per cent Diamine Fast Yellow FF,
1.50 per cent Diamine Fast Yellow CP and
0.15 per cent Radio Brown B.

Formula No. L-22—Grayish Brown, Method No. 101.
0.05 per cent Diamine Fast Blue FFB,
0.06 per cent Diamine Fast Brown GF,
0.10 per cent Diamine Fast Yellow FF,
0.03 per cent Lanacyl Blue BN,
0.02 per cent Milling Yellow O and
0.12 per cent Radio Brown B.

Formula No. L-23—Brown, Method No. 101.
1.80 per cent Diamine Fast Blue FFB,
1.50 per cent Diamine Fast Brown GF,
0.50 per cent Diamine Red 8BL,
1.00 per cent Diamine Fast Yellow FF,
1.20 per cent Diamine Yellow CP and
0.50 per cent Lanacyl Blue BN.

Formula No. L-24—Greenish-Blue, Method No. 101.
1.50 per cent Diamine Fast Blue F3G,
0.20 per cent Diamine Fast Yellow FF,
0.25 per cent Lanacyl Blue BN and
0.12 per cent Tetra Cyanole A.

Formula No. L-25—Violet, Method No. 101.
1.50 per cent Diamine Heliotrope B,
0.50 per cent Diamine Brilliant Blue G,
0.70 per cent Lanacyl Violet BB and
0.15 per cent Formyl Violet S4B.

Formula No. L-26—Black, Method No. 101.
6 per cent Union Black VA.

Formula No. L-27—Brown, Method No. 101.
0.20 per cent Diamine Fast Blue FFB,
1.20 per cent Diamine Fast Brown GF,
0.15 per cent Diamine Fast Yellow FF,
0.50 per cent Milling Yellow O,
0.30 per cent Radio Brown B and
0.25 per cent Croceine AZ.

Formula No. L-28—Gray, Method No. 101.
0.70 per cent Diamine Fast Blue FFB,
0.20 per cent Diamine Fast Brown GF,
0.18 per cent Diamine Fast Yellow FF,
0.18 per cent Milling Yellow O,
0.20 per cent Lanacyl Blue BN and
0.18 per cent Croceine AZ.

Formula No. L-29—Red, Method No. 101.
5 per cent Diamine Fast Red 8BL.

Formula No. L-30—Black, Method No. 101.
2.00 per cent Diamine Black HW,
1.00 per cent Oxydiamine Yellow TZ,
0.40 per cent Milling Yellow O,
0.30 per cent Naphthol Blue G and
0.25 per cent Tetra Cyanole A.

Formula No. L-31—Bronze, Brown, Method No. 101.
2.00 per cent Diamine Black BH,
2.00 per cent Diamine Fast Brown GF,
1.00 per cent Diamine Fast Yellow FF,
1.50 per cent Diamine Yellow CP,
0.25 per cent Brilliant Milling Red R and
0.40 per cent Cyanole A.

Formula No. L-32—Blue, Method No. 101.
4.50 per cent Diamine Black BH,
2.00 per cent Alphanol Blue GN and
1.00 per cent Brilliant Milling Blue B.

Method No. 101: *Dyeing Wool-Cotton Unions Containing Acetate Silk Effects.*—Dye in the usual manner for wool-cotton unions, with the addition of from 5 ounces to 2 pounds of sodium sulphate per 10 gallons of dyebath, according to the depth of shade desired. Enter the goods at 40 to 50 deg. Cent. (105 to 120 deg. Fahr.), raise to the boil and dye for an hour at near the boiling point.

Method No. 102: *Dyeing Wool-Cotton Unions Containing Acetate Silk Effects.*—The wool may be dyed as

in Method No. 100 and rinsed well. The cotton is then dyed in a lukewarm dye bath containing the direct dyes, 0.5 to 1 pound of sodium sulphate and 0.75 ounce of soda ash. After dyeing the goods are rinsed and acidified with acetic acid.

Method No. 103: Dyeing Wool-Cotton Unions Containing Acetate Silk Effects with Developed Dyes—The cotton is dyed for one hour at 60 to 70 deg. Cent. (140 to 160 deg. Fahr.) in a dye bath containing the direct dyes and about two pounds of sodium sulphate per ten gallons of dye bath. The material is then rinsed and diazotized for 10 or 15 minutes in a cold bath containing 1.5 to 3 per cent of sodium nitrite and 5 to 7.5 per cent of 32 deg. Tw. hydrochloric acid, or 3 to 5 per cent of 168 deg. Tw. sulphuric acid. They are then quickly rinsed in cold water acidulated with hydrochloric acid, and developed for 15 to 30 minutes in a cold bath. The wool is cross-dyed as in Method No. 100.

Method No. 104: Dyeing Wool-Cotton Unions Containing Acetate Silk Effects.—Dye the cotton for one hour at 60 to 70 deg. Cent. (140 to 160 deg. Fahr.) in a bath containing the dyestuff, 2 pounds of sodium sulphate and 0.75 ounce of soda ash per 10 gallons of bath. Rinse and dye the wool with the addition of 2 to 4 per cent of sulphuric acid at a gentle boil.

Besides the list of suitable dyes given under the acetate silk-cotton unions the following dyes are especially recommended for use upon wool-cotton unions containing acetate silk effects.

Cotton and Union Dyes

Diamine Fast Yellow B, FF, R, A and M.
Oxy Diamine Yellow TZ.
Diamine Yellow CP.
Union Fast Yellow G.
Diamine Orange D.
Diamine Brilliant Orange SS.
Diamine Fast Scarlet 4BS and 7BS.
Diamine Rose GD and BD.
Diamine Fast Rose BBF.
Diamine Fast Red 8BL.
Diamine Fast Rubin FB.
Diamine Brilliant Bordeaux R.
Diamine Fast Red Violet FR.
Diamine Heliotrope B.
Diamine Fast Brown GF.
Diamine Fast Blue F3G, F3B, FFG, FFB, C and CG.
Oxy Diamine Blue 5G, PG, and PB.
Diamine Fast Brilliant Blue R.
Diamineral Blue R.
Diamine Steel Blue L.
Diamine Brilliant Blue G.
Diamine Dark Blue B.
Union Fast Blue MB and FR.
Union Fast Gray BR.
Oxy Diaminogene OB.
Diamine Black BH.
Para Diamine Black FFB extra conc. and BF extra conc.
Union Black VA.
Paramine Black WS.
Paramine Fast Orange D and G.
Paramine Fast Yellow 3G.
Paramine Sky Blue FF.
Paramine Fast Pink B.
Paramine Blue 2B New.
Paramine Black BH.
Paramine Burl Black RMW.
Diamine Azo Scarlet 4BL extra, 6BL extra and 8B extra (diazotized and developed with *B*-naphthol).
Diamine Azo Fast Red 5B and 6B (diazotized and developed with *B*-naphthol).
Diamine Azo Bordeaux R B and K3B (diazotized and developed with *B*-naphthol).
Diamine Azo Navy Blue B conc. (diazotized and developed with *B*-naphthol).
Diaminogene Blue GG and NBB (diazotized and developed with *B*-naphthol).

Acid Dyes

Milling Yellow O and 3G.
Radio Yellow R.
Brilliant Milling Red R.
Scarlet EC.
Croceine AZ.
Azo Red A.
Alizarine Cyanole B.
Alizarine Brilliant Green G.
Tetra Cyanole A.
Formyl Blue B.
Brilliant Milling Blue B.
Lanacyl Blue BN and RN.
Naphthol Blue G.
Alphanol Blue GN, BR extra, and 5 RN.
Lanacyl Violet BF.
Lanacyl Navy Blue B.
Formyl Violet S4B.

The following dyes stain acetate silk slightly and may therefore be used only sparingly on wool-cotton unions:

Cotton and Union Dyes

Diamine Fast Yellow 4G.
Diamine Fast Orange ER.
Diamine Fast Scarlet 10BS and GG.
Diamine Purpurine 6B.
Diamine Heliotrope G.
Union Fast Heliotrope B.
Diamine Red 4B.
Diamine Brilliant Rubine S.
Diamine Violet Red.
Diamine Violet N.
Diamine Fast Violet BBN and FFBN.
Oxy Diamine Violet B.
Union Violet KB.

Diamine Brown M and ATC.
Diamine Fast Brown R and GB.
Diamine Catechine 3G.
Union Fast Brown G.
Diamine Green G.
Union Fast Green GG.
Diamineral Blue CVB and BB.
Diamineral Brilliant Blue B.
Union Sky Blue KF.
Union Blue KG, BJ, BB and KHS.
Union Navy Blue KPB and KO.
Union Gray BBG.
Diaminogene B, and extra.
Diamine Black HW.
Oxy Diamine Black A.

Acid Dyes

Anthracene Yellow C.
Brilliant Milling Orange GR.
Rosazeine B.
Lanazurine K2R and KB.
Radio Brown B and S.
Alphanol Brown B.
Alizarine Cyanole Violet R.
Brilliant Milling Green B.
Anthracene Direct Green B.
Naphthol Dark Green G.
Alphanol Fast Gray B.
Acid Violet 6BS.
Formyl Violet 10 B.
Alphanol Black 3BN and KWAN.
Naphthol Blue Black.
Radio Black ST and SB.

The following dyes which are frequently used on wool-cotton unions are unsuited for use where there are acetate silk effect threads:

Cotton and Union Dyes

Throflavine S.
Diamine Orange B and F.
Oxy Diamine Orange G.
Union Fast Orange G and R.
Diamine Scarlet B and 3B.
Diamine Fast Red F.
Diamine Red 6B and 10B.
Union Fast Red R.
Diamine Purpurine B.
Diamine Bordeaux B and S.
Diamine Fast Bordeaux 6BS.
Union Fast Bordeaux FR.
Diamine Brown MR and B.
Oxy Diamine Brown 3GN, G and RN.
Diamineral Brown G.
Diamine Catechine G and B.
Union Fast Brown GG, LL, TD and MP.
Union Dark Brown A.
Oxy Diamine Violet G and BF.
Diamine Green HS and B.
Diamine Dark Green N.
Union Green VT.
Union Olive KD.
Light Blue 5380.
Oxy Diamine Blue G.
Union Navy Blue VB.
Union Fast Dark Blue B and R.
Diamine Fast Gray BN.
Diamine Black DN.
Diamine Fast Black X.
Oxy Diamine Black JEI, JW, UI and G extra conc.
Diamine Aldehyde Black FF conc. and FFB conc.
Union Fast Black SB.
Union Black S, BG, 3B, KAX, BD conc., and KRN conc.

The acid dyes given under the list as unsuited for dyeing woolen materials containing acetate silk are also, of course, unsuited for use on wool-cotton unions containing acetate silk effects, as well as the following:

Acid Dyes

Indian Yellow FF.
Tropaeoline G.
Orange extra and R.
Radio Red G.
Wool Red B.
Alizarine Cyanole Red B.
Rosazeine B.
Alizarine Cyanole Green Blue B.
Naphthylamine Black 6B.
Neutral Wool Black B and G.
Alphanol Black BG.

(Part XVI will appear in an early issue.)

CHEMICAL FOUNDATION PATENTS

The Chemical Foundation, Inc., has issued a booklet of some seventy-odd pages listing the numbers of the United States Patents which it owns and which are available for license to all American manufacturers, grouped according to the classification adopted by the United States Patent Office. These patents cover a multitude of industrial technical processes and products, ranging from ships and sewing machines to tobacco and textile chemistry. The patents on various chemical processes cover many pages and are listed under a number of different headings, according to the particular product or process to which they relate. Over one hundred patent numbers are listed under Bleaching and Dyeing, about half of this number covering dyeing processes. A brief foreword by Dr. Chas. H. Herty explains the reason for the publication of this booklet and urges manufacturers to secure copies of patents in which they are interested. The booklet may be obtained from the Chemical Foundation, Inc., 85 Beaver Street, New York City.

Proceedings of the American Association of Textile Chemists and Colorists

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SEPTEMBER MEETING OF THE NEW YORK SECTION

The first fall meeting of the New York Section was held Friday evening, September 25, at the Machinery Club, New York City. Forty-two members and guests attended an informal dinner preceding the meeting, and a number more came in later, bringing the total attendance to approximately sixty.

Chairman Grandage presided and, after the transaction of the routine business of the section, introduced Henry F. Herrmann, Chief Application Chemist of the National Aniline & Chemical Company, who read a paper, entitled "Further Notes on the Science of Dyeing." This paper is published in full herewith.

Following the reading of Mr. Herrmann's paper there was considerable discussion regarding topics for future meetings. It was eventually decided that the Chairman should appoint a Program Committee whose duty it would be to canvass the members in an effort to obtain a consensus of opinion as to most suitable topics and, these topics having been determined upon, to secure speakers for the balance of the year along the lines indicated.

Respectfully submitted,
DANIEL P. KNOWLAND, Secretary.

Further Notes on the Science of Dyeing

By HENRY F. HERRMANN

It is about a year since I had the pleasure of addressing you on the subject of the science of dyeing. In this discussion we examined the phenomena relating to the attachment of dyes to fibers which, broadly speaking, constitutes the essence of dyeing. Since the topic is involved in much theory and controversy it is as yet impossible to speak of definite laws of dyeing, and the practical dyer is apt to shrug his shoulders and think even though he is too polite to say it, "How does all this scentific talk help me: it confuses more than it explains." He weighs off his colors, dissolves them (maybe), fixes his dye bath and is ready to proceed. But does he always succeed? Yes—providing he uses proper dyes and suitable methods. Alas, for each technically valuable dye there are dozens, never successfully marketed, that are lacking in those properties which the dyer needs, and for each correct dyeing process there are probably thousands, tried and untried, which fall far short of producing acceptable results.

What then constitutes a successful dye, or, inquiring from a different angle, what properties must a dye have to be valuable and on what inherent structural feature of the dye do these properties depend? As for dyeing methods, we may dismiss the matter for the time being with the simple explanation that the method must be adapted to the fabric which is being dyed, and must suit the chemical characteristics of the dye to be used.

One of the fallacies in the work of some of the most illustrious investigators, we noted in our former discussion, lies in the tendency to generalize on the basis of insufficient evidence—too few particulars. Interesting observations concerning a special dye, admittedly true, were stretched to cover all dyes. Experiments with one fiber were used to draw theories on chemically and physically different fibers.

That class of organic substances which possess color

and are capable of imparting their color to fabrics is termed dyes. For no other reason could so many different chemical individuals be classed in one group. And because of their manifold individualities we should think of them in subdivisions or small related groups, rather than as one all-inclusive class, in attempting to study them. The practical dyer has learned how to do this, and his success depends on the skill with which he recognizes these individualities and adapts his method of application to them. It is unfortunate that the scientists as a class know so little of the intimate peculiarities of individual colors. Much that they seek in the test tube is apparent in the dye kettle, and is common knowledge to the observant dyer. In order that we may guide our thoughts toward a clearer comprehension of the matter I propose to discuss the chemical characteristics of dyes as a class and in small related groups. The approach of this subject is elementary to an audience of technical men, but I ask you to follow the visible beaten paths in order that we may more easily steer our way along the hidden trails.

Color, first of all, depends on light. Without light we cannot have color. No substance possesses color in the absence of light. The color of a body, gas or liquid absolutely depends on the light which it reflects or radiates. Since ordinary dyes do not radiate rays visible to the eye we may confine our discussion to reflected light in the case of opaque solids and transmitted light in the case of transparent objects and liquids. Objects possess individuality of color due to their property of absorbing light rays of certain wave length or frequency and of transmitting or repelling others. Just as a system of inductances and capacities is attuned to definite frequencies or wave lengths of the ether vibrations used in radio communication, just so due to their chemical and physical pecularities molecular systems are attuned to the much higher light frequencies; they absorb some and pass on others.

Ordinary sunlight may be resolved into six primary colors. We ordinarily use a glass prism for this purpose, but in an homologous manner all colored substances resolve or refract light, and it is that fraction of the light which passes on or is reflected that gives it its individual color. The absorbed portion is invisible. It is the complement of that which is visible. Logically, then, the proper blending of complementary colors should cause white. This can actually be demonstrated in the laboratory.

We now come to the consideration of the chemical features of dyes which render them responsive to certain light rays. It may be interesting in passing to note that the visible rays are not the only ones that work on chemicals. Some substances are radio active and experimentally have been used to function in the manner of the well-known radio tube. This property is due to cold electron emissivity, and is an interesting side-light on the activity of seemingly inert substances.

Chemical elements as well as their compounds exhibit colors. Iodine, sulphur, bromine, phosphorus, copper, gold and tin are typical instances. The salts of the metals carry a more pronounced color. Why then are they not suitable for use as dyes? We shall see.

The simple organic compounds resulting from the union of carbon with oxygen, nitrogen or sulphur are generally colorless or white. Why, then, do other organic substances possess color? On what properties does color depend? Is color as the aim of the research chemist pure chance? Are dyes discovered by accident or is it possible for the chemist to plan colors in advance and in a measure control his research accordingly?

Without attempting to delve too deeply into the abstruse and abstract chemical phases of the problem for which much blackboard illustrating is necessary, and without trying to fully understand the complicated maze of scientific conditions which confront the present day experimenter in advanced organic research, we can roughly chart the general trend of his reasoning. Since an ordinary total analysis of organic substances does not distinguish between those which are colored and those which are uncolored it is obvious that the mere presence in a molecule of certain elements (not even in definite proportions) does not result in color. Roughly two parts of copper, one of tin and one of zinc yield a certain grade of brass. Varying the proportion alters the physical characteristics, but considerable leeway is permitted as to the ratio used. Not so with organic combinations. So many parts of carbon, so many of hydrogen, so much oxygen, nitrogen and sulphur may give a dye—but the same proportions differently associated may yield a colorless substance.

We may, therefore, deduce that color depends on chemical structure, on the manner in which the atoms are linked together or, in short, on the character of the molecule. In combining chemicals the use of strongly colored substances need not necessarily lead to a still stronger colored product. Quite frequently the union of two colorless substances will result in the most intense dyes.

In attempting to explain color formation and dyeing properties as applied to organic substances a well-known chemist, O. N. Witt, in 1876 announced a theory which is still held to-day and has proved a definite guide to the chemist. He assigned the name chromophores to certain atomic groupings which are usually encountered in colored substances and, a priori, may be considered necessary for color in organic compounds.

In order to exert its influence, a chromophore must be associated with a large number of carbon atoms. For this reason highly colored substances are usually encountered among the derivatives of hydrocarbons such as benzene, naphthalene and anthracene, the so-called aro-

matic hydro-carbons. By a combination of a chromophore with an aromatic compound, a new product is obtained. This is more or less colored and is one step nearer to being a finished dye. This substance is called a chromogen. Whereas chromophores are relatively few in number and are frequently repeated, chromogens are all more or less different and are responsible for individuality among dyes with respect to color.

Two typical chromophores are the well-known divalent azo form—N = N—and C O. The former, when linking together two moles of benzene, forms the chromogen azo benzene; the latter, anthraquinone. Fundamentally the aromatic base is the same, but with different chromophores two totally different chromogens are found.

Chromogens, on reduction with nascent hydrogen, yield colorless compounds, but these conversions are usually reversible. A chromogen so decolorized is termed a leuco compound, but to be a true leuco body it must be susceptible of reoxidation to its original color.

Certain definite reactive features are characteristic of finished soluble dyes. They are either acid, basic or neutral, due to the presence of certain additional groups necessary to render the chromogen soluble. The added groups are called auxo-chromes. They are chemical linkings which are capable of salt formation. The most typical and common ones are OH, SO_3H and COOH which are acidic and NH_2, NHR, NR_2 (substituted amines) which are basic. Of these auxochromes the COOH and SO_3H groups may usually be introduced with a chromogen without altering its shade materially. Intensified acidity (or basicity) results in increased dye value, and this is the true value of the auxo-chromes. Aside from their solubilizing influence the basic auxo-chromes have a more pronounced effect on the tinctorial power as well as the shade of the chromogen.

In considering the auxo-chromes as necessary adjuncts to chromogens to render them suitable as dyes, it does not seem far-fetched that chemically active textile fibers should exert an affinity for organic substances of the chromogen type. The affinity of cotton for tannins and for the anilide of beta-oxy-naphthoic acid are examples of such attractions although they do not result in colored bodies.

It is well to emphasize that the dyeing properties of dyes are due to the auxo-chromes present. On them depends the acid, basic or substantive character of the dye, its solubility and its exhausting properties. The shade and fastness properties depend rather on the chromogens.

It should prove instructive to survey the more important dye classes and to name the most important members. The groups are named after the chromophore they are built on.

Nitro Dyes.—This class of dyes contains the chromophore NO_2. The nitro derivatives of the hydrocarbons are practically colorless, but with an increase in the number of the nitro groups the color intensity increases; nitro phenol is practically white; di-nitro phenol is light yellow, but tri-nitro phenol, the well-known picric acid, has a very marked tinctorial power.

The nitro chromophore lends an acid character to the chromogen. Since it is usually true that increased acidity (or basic character) heightens the colorific value, it is preferable to combine the acid NO_2 chromophore with the acid auxo-chromes OH, SO_3H. Basic auxo-chromes such as NH_2 oppose this acidity and suppress the color. When basic auxochromes are to be used it is necessary to compensate for them by an increase in the number of NO_2 groups. The majority of nitro dyes are derivatives of phenols and naphthols and their sulphonic acids for this reason.

Picric acid, lacking sufficient auxo-chromes, is sparingly soluble in water and is difficult to apply as a dye. The introduction of further acidic sulphonic acid auxo-chromes results in more valuable properties. The important dye, Naphthol Yellow S, which is homologous to di-nitro phenol but contains two sulphonic groups, exhibits for this reason the solubility and dyeing properties expected of a true dye.

The nitro group was discussed in some detail to illustrate the practical operation of the theory of balance between chromophores and auxo-chromes. The remaining groups will be treated very briefly.

Nitroso or Quinone-Oxine dyes contain the chromophore—NO—formed by the action of nitrous acid on phenols or naphthols. Typical dyes are Gambine G or Y and Naphthol Green B.

Azo dyes comprise at least one-half of all commercial types. They are characterized by the chromophore —N = N in simple or modified form. Among the azo dyes are representatives of all groups—acid, basic and substantive. In enlarging upon the thought previously brought out that the chemist can and must aim his work along definite lines, it should prove interesting to touch on a few of the rules governing the simple coupling process of aromatic bases to diazotized amines. Most dyers have at some time carried out similar processes, hardly realizing that the operation is governed by set rules.

1. Coupling takes place in the para position to the auxo-chrome group OH, NH_2, NR_2 when this is free.

2. If the para position is occupied, coupling occurs in the ortho position.

3. If both ortho and para positions are occupied, coupling does not occur.

Typical azo dyes are Direct Black and Benzo Purpurine; Acid Fuchsine D and Naphthol Blue Black; Bismarck Brown and Indoine Blue.

Hydrazone dyes contain the chromophore —NH—N. Typical dyes are Tartrazine, Xylene and Fast Light Yellows.

Stilbene dyes contain the chromophore —CH = CH—

as occurring in stilbene or diphenyl ethylene $C_6H_5 — CH = CH — C_6H_5$. Typical dyes are Sun Yellows and Mikado Oranges.

Diphenyl methane dyes contain the chromophore $—CH_2—$ which in the case of Auramine is substituted to C — ..
NH.

Triphenyl methane dyes comprise a very large group based on oxidized hydrocarbons of methane character known as carbinols. These carbinols form the chromophores. They are colorless. To obtain dyes auxochromes are introduced into the carbinole molecule in the para position to the carbon atom of the methane residue. Hence there are two groups of these dyestuffs.

1. The amido or alkyl amido derivatives using basic auxo-chromes and yielding basic dyes such as Malachite Green, Magenta and Victoria Blue.

2. The hydroxy derivatives using OH auxo-chrome such as the aurines.

Xanthene dyes comprise the phthaleins, eosines, phloxines and rhodamines. They contain the typical group of the anhydride of odehydroxy diphenyl methane.

$$C_6H_5 < \begin{matrix} O \\ \\ CH_2 \end{matrix} > C_6H_4$$

We may go on to mention the Acridine, Anthracene, Quinone Imide, Thiazines, Indigo and Indigoid, Thiazols, Sulphur and Aniline Black series, but I believe that the ground covered is sufficient to guide the thoughts of my listeners to a clearer understanding of dye structure and the relationship of structure to color and dyeing properties.

The literature on the subject is limited and I might refer those interested to Dr. Bucherer's Farben Chemie.

OCTOBER MEETING OF SOUTHERN SECTION

The Southern Section of the American Association of Textile Chemists and Colorists will hold its annual meeting in Greenville, S. C., on Saturday evening, October 10.

A program of unusual interest to the Southern textile industry has been arranged.

Dr. Charles H. Herty, president of the Synthetic Organic Chemical Manufacturers' Association, will make the principal address, dealing with the American dyestuff industry. Dr. Herty is best remembered in the South as the head of the Chemistry Department at the University of North Carolina for many years, later going to New York City, where he has taken leading rank among the nation's distinguished chemists. The South is particularly fortunate in having Dr. Herty again in its midst to discuss an industry of absorbing interest to everyone, of which he is the chief spokesman.

R. W. Arrington, superintendent of the Union Bleachery, of Greenville, S. C., will present a paper relating to "The Dyeing and Finishing of Woven Fabrics Containing Rayon"; as Mr. Arrington has been an important factor in building up one of the leading cotton finishing plants, not only in the South, but in the whole country, his message will doubtless be received with interest by many mills who are to-day experimenting with fabrics and fibers unfamiliar to them until a short time ago.

A film illustrating many of the operations in the manufacture of dyes in the extensive plant of E. I. du Pont de Nemours & Co. near Wilmington, Delaware, will be a principal feature of the meeting.

Applicants for Membership

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Benzin, Ernest H., colorist, National Aniline & Chemical Company, New York City. Sponsors: H. F. Herrmann and C. C. Knights.

Curtis, Francis J., technical adverser, sales department. Merrimac Chemical Company, Boston, Mass. Sponsors: R. O. Fernandez and J. F. Bannan.

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Everist, Thomas B., laboratory superintendent, Cold Spring Bleachery, Yardley, Pa. Sponsors: Edw. W. Adams and Lee D. Pettingill.

Gallagher, Harry A., dyer, Maumee Finishing Company, Toledo, Ohio. Sponsors: R. L. Burnett and D. C. Newman.

Hewitt, Frank C., chemist, Merrimack Manufacturing Company, Lowell, Mass. Sponsors: R. B. Clogston and Geo. Stewart.

Lesser, E., chemist, American Dyewood Company, 72 Gold Street, New York City. Sponsors: D. P. Knowland and A. Ellsmann.

Micheles, Leo H., dyehouse chemist, Robinson Rayon Company, New York City. Sponsors: D. P. Knowland and A. Ellsmann.

Smith, Thos. R., overseer of dyeing and mercerizing, Crystal Springs Bleachery Company, Chickamauga, Ga. Sponsors: H. M. Chase and H. W. Ormand.

Junior

Thompson, Edw. F., assistant dyer and chemist, Peerless Plush Manufacturing Company, Paterson, N. J. Sponsors: E. C. Bertolet and P. Theel.

Changes of Address

Appel, William D., 4421 Lowell Street, Washington, D. C.
Clapham, H., 19 Ellington Avenue, Rockville, Conn.
Corkum, H. D., 58 Park Avenue, Manchester, N. H.
Fletcher, Allison R., 960 Maryland Avenue, Washington Park, Providence, R. I.

Scientific Washing

Part IX — Bleach

Caustic and Lime Soda Bleach—How to Make Lime-Soda and Caustic Bleach—The Chlorine Percentage —Good Points of a Liquid Bleach

By F. H. GUERNSEY

Cowles Detergent Company

THERE are many concerns offering bleach for sale in a liquid form. The increasing number of questions asked about the use of this "liquid" or "caustic" bleach prompts a short discussion upon its merits and demerits in comparison with "home made" bleaches. By the latter term we mean those prepared by the common and well known method of converting calcium hypochlorite (lime bleach) into sodium hypochlorite (soda bleach or "soft bleach") by precipitation of the lime with pure soda ash or modified soda ash.

For reasons discussed elsewhere (see Part VII*) ordinary lime bleach or calcium hypochlorite will not be considered here as a washroom bleach.

How to Make a Lime-Soda Bleach

The time tried method of preparing a soft bleach consists of:

1. Working a quantity of lime bleach into a cream or slurry in cold water.
2. Thinning with sufficient cold water to make up about half of the ultimate total volume.
3. Adding the required amount of soda ash or modified soda, with stirring.
4. Making up to the required volume with water.
5. Allowing the precipitated lime to settle out.

In using this bleach utmost care must be exercised to discard the sludge in the bottom of the crock. The standard quantities taken in laundry practice are 10 pounds of chloride of lime (lime bleach), 10 pounds of soda ash (or 20 pounds of modified soda) and water to make 30 gallons.

What the Chlorine Percentage Is

Theoretically, this liquor will contain 1.4 per cent chlorine by weight, but allowing for losses in decomposition of the lime bleach, and the liquor itself, the liquor as actually used will analyze more nearly 1.0 per cent than 1.4 per cent.

The quantities customarily used in the washwheel result in an ultimate washwheel concentration of .01 per cent or less. On a standard washroom formula it will average about .008 per cent.

The principal objections to lime-soda bleach are the trouble of preparation, and the danger of some of the lime sludge finding its way into the washwheel. In a busy washroom the latter is a very serious matter to consider.

How Caustic Bleach Is Made

A sodium hypochlorite or soft bleach solution may be purchased in a concentrated form, commonly known as "liquid bleach" or "caustic bleach." These bleaches are prepared by passing liquid chlorine gas into a cold solution of caustic soda and soda ash, the latter being present in relatively small amount as a stabilizer.

A good liquid bleach will contain about 12 per cent by weight of available chlorine and not to exceed 3 per cent of excess caustic.

In the use of a strong or concentrated bleach solution, such as "caustic bleach," it is only necessary to remember that about *one-twelfth* as much is required as of a lime-soda bleach to do the same amount of work.

A particular example which came to our attention in the course of service will serve to show how a liquid bleach must be "thinned" out or diluted. A mill owner requested us to check up his method of using one of the standard trade-marked brands of liquid bleach. The bleach in question contains 12 per cent available chlorine by weight, 2½ free caustic soda, and has a specific gravity of 1.2.

Our mill man diluted 14 quarts of this strong bleach to 50 gallons with water. The resulting solution contains 1.0 per cent chlorine by weight, or in other words is equivalent to a standard lime-soda bleach. Six quarts of this stock solution are used in a 42 by 96 8-pocket wheel, in six inches of water. Temperature 160 deg. Fahr. for ten minutes. Sometimes bleaching is done in the suds and at other times in the clear. The loaded machine under these conditions will contain upward of 190 gallons of water, and the resulting solution contains .007 per cent available chlorine, or practically the same amount as when the lime-soda bleach is used.

At first thought one might have the impression that the causticity of a liquid bleach would be felt in the washing process in the form of damaged goods. Calculation, how-

*Part VII, which also treated of bleach, appeared in three consecutive instalments on pages 249, 287 and 325 of Vol. XIII (1924). Other papers in this series, covering soap, alkali, water, etc., appeared in Vol. XII, Vol. XIII and the current volume.

ever, reveals that the actual percentage of caustic in the wash water of the wheel is .0014 per cent. This is negligible. Nevertheless, we would advise laundry owners who purchase liquid bleach to insist upon a guarantee that the solution as purchased does not contain more than 3 per cent free caustic soda. Naturally, it will pay to buy only reputable brands.

Liquid Bleach Has Many Good Points

The convenience, freedom from lime, and satisfactory costs should lead to more general use of liquid bleaches.

At the same time no mill should adopt this method of obtaining bleaching effect unless it has a dependable system in the washroom, for the chances of destroying goods by using too much are obvious, should careless methods prevail.

We believe the purchase of prepared solutions is much better than the preparation of bleach from caustic soda and liquid chlorine by the mill itself. There are many hazards in handling liquid chlorine, and last but not least, if a drum of chlorine should happen to get beyond control through a sudden leakage or other cause, the effect which the stifling and corrosive fumes would have upon the neighborhood would not stimulate public confidence in the laundry or mill.

Removal of Stains and Spots in Finished Goods

By T. JOHNSON

Technical Department, Oakley Chemical Company

EXPERIENCE is the greatest teacher, but it has been aptly stated that anyone who cannot learn something from the experience of others is too dull to discover anything of real importance for himself. If all the troubles due to stains and spots found in finished fabrics and the ingenuity exercised in discovering the causes and correcting them were recorded, they would represent experiences of unusual value to the industry.

Before any attempt is made to remove stains and spots, the first point that is always inquired about is the cause. Some stains cannot be removed at all while others can be completely removed without necessity of rewashing the entire piece. The ability to identify stains is of great advantage when attempting to remove them. Without it a number of methods often must be tried until an effective one is found. Being able to recognize stains is, however, of greater importance because it enables one to locate more readily the causes for them. Practically all spots and stains in finished fabrics are avoidable, and once their causes have been discovered the necessary precautions should be taken to prevent them from occurring.

Methods of removing stains and spots in fabrics cannot be discussed here in detail, but stains and spots may be classified into several groups according to their causes. Means of removing them where possible and preventing them on future production can also be suggested. The following are the more common classes:

1. Stains due to contact to dirty machines, containers, racks, floors, etc.
2. Stains due to action of solutions on metals or wood used in construction equipment.
3. Stains due to water conditions.

In general, spots and stains cannot be satisfactorily removed from finished goods dyed in the piece. They must be detected and removed before dyeing because they will cause blotches in dyeing which cannot be corrected. Fabrics manufactured from dyed yarn or raw stock can be treated to remove spots and stains. If these are few in number, careful treatment will make it possible to remove them without rewashing the entire piece. If, however, they are numerous it is preferable to rewash the piece after removing the stains in order to secure a uniform appearance.

Stains due to contact with dirty machinery, containers, racks and floors are perhaps the most prevalent and are due almost entirely to carelessness. They are, of course, avoidable to a large degree. They may consist of black oil or grease from the bearing of machines or from overhead shafting where lubricant is apt to be used in excess. Oil can be removed by solvents such as gasoline and benzine or carbon tetrachloride if a non-inflammable solvent is desired. If hard greases containing metallic soaps are used, there is less danger of contact of the fabric with them, but they cannot be removed by solvents effective for oil. The iron contained in the black oil can usually be removed by oxalic acid after the oil has been removed. The remedy is, of course, thorough cleaning of the bearings and more judicious use of a properly selected lubricant.

Grease and soap deposits often accumulate in the washing machines and are picked up by the fabric. Streaks in the fabric usually indicate that it has been drawn over a greasy surface during or after scouring in the rope. Solvents will be effective for partially removing such stains, but will not remove soap deposits as they are due to the insoluble soap formed by the action of hard water. The remedy is thorough cleaning of the scouring machine and keeping it clean. Regular inspection should

be made to be sure that it is done. Dye kettles should be scrubbed out carefully at regular intervals and should always be cleaned when changing from one color to another to prevent streaks and stains from this cause.

Stains due to contact with dirty containers, racks or floors may vary considerably in nature and are often difficult to account for because they occur less frequently and only on a comparatively small part of the fabric. They may be removed completely in most casts by spotting.

Stains are sometimes caused by the action of solutions on metal or wood used in the construction of equipment. Cypress and maple are considered to be the most suitable for vats, rollers and other parts of machines with which goods come in contact. Woods such as pine containing resin, and oak containing tannin, when used in machines, racks or boxes can cause some very puzzling stains, particularly when dyeing follows the exposure to them. If the stains are not apparent before dyeing, the condition cannot be foreseen. Iron stains due to contact with rusted iron parts of machines are quite common. These can be removed with oxalic acid. They also produce blotchy effects in dyeing which cannot be corrected. Copper vessels and appliances used in dyehouses if neglected will corrode to produce green copper compounds which cause stains that can be removed with a weak sodium cyanide solution before dyeing. Stains due to corrosion of metal parts of machines usually occur from leaving goods in the machines overnight. This practice should be avoided. Copper kettles, vessels and appliances should be cleaned to prevent corrosion. Monel metal is coming into extensive use and is very satisfactory for dyehouse equipment.

Stains due to hard water conditions are perhaps the most difficult to identify, but of course they are not to be expected unless the water in use is known to be hard. Hard water is one of the causes for dirty scouring machines because the insoluble soap scum produced in scouring is very sticky and holds grease, dirt, iron rust, wool-flocks and any other filth in the machine. These soap residues are not dissolved by alkaline solutions. They can be broken down by means of hydrochloric acid which can be applied to the spots if they are few and apparent, because of the dirt they contain. This should be followed by washing out with water to remove the acid and a dilute alkali to remove the fatty acids. If the entire piece has to be rescoured, soap must also be used to wash out the dirt and grease picked up with the insoluble soap.

The remedy for this condition, of course, lies in treatment of the water to soften it before using it so that soap deposits will not form. The selection of more efficient detergents has often been found effective for softening the water and holding the grease in emulsion so that sticky soap deposits do not accumulate in the scouring machine. The action of such a combination, however, will also be more efficient with properly treated water. Therefore, while the condition can be largely overcome without the installation of water softening equipment, it is advisable to provide softened water. The advantage of soft water for washing out after scouring is very pronounced. The running of hard water onto soapy goods will sometimes produce streaks which will resist dyes. As these are not apparent until after dyeing, there is then no remedy for them except to remove them as already described and redye the piece to a darker color so as to cover the blotches and streaks.

In general similar spots and stains which occur regularly in finished fabrics should not be considered as due to unavoidable accidents. When the cause for them is not at once apparent, the discovery of a method for removing them by trial of different materials will give a clue to the cause which should then be hunted down and eliminated. Preventing the occurrence of stains should be the first aim as there are so many which cannot be removed satisfactorily without refinishing the piece at additional cost and perhaps redyeing it to a color which does not command as good a price.—The Hunter Bulletin.

Producing Dyed Shades Fast to Bleaching

Use of Vat Dyes—Prevention of Kier Boil Faults

IN the production of dyed shades on cotton which are fast to bleaching several things have to be taken into consideration. In the first place, the dyed shades must be naturally fast to the bleaching operation itself through which cotton goods pass. In the old days, a generation ago, pieces were woven with effect threads and the yarn composing the pieces was scoured and bleached before weaving. In the process of manufacture the goods naturally became very dirty and got oil and other weaving marks on them, and the results were by no means comparable with those obtained to-day. To-day, by the use of suitable colors, we can first dye the yarn to the shade required and then weave it into the piece and submit the material to the piece-bleaching process. In this way a much cleaner result is given than was possible by the old method.

Laundry and Household Washing

It is not, however, merely the bleaching process itself which dyed goods have to resist. Effect threads are woven into innumerable styles of cotton fabrics which undergo the action of often very severe bleaching agents after they are made up into the garment. This is due to the modern methods of laundering and the severe bleaching chemicals which are employed. The commonly employed compounds for improving the household wash, speeding up the work of the wash, etc., are often substances which exert a very severe action on the colors in the materials when subjected weakly to their influence. Many of the so-called patent bleaches are composed of chlorine bleaching agents, hypochlorites, peroxides, perborates, and so on, which even when used in the most careful housewife's hands may produce a disastrous ef-

fect on certain shirting, etc., materials, and when employed in careless hands may give the finishing touch to the disappearance of an effect thread as a colored stripe.

The bleaching process, however, is of prime importance to the cotton yarn dyer, when the yarn he is dyeing is to be woven into material which has to pass through the bleaching operation. He must make a very careful choice of dyestuffs to use. The process itself consists essentially of boiling the material first under pressure, in a closed kier, with caustic soda, and then treating with chloride of lime solution (chemic) or sodium hypochlorite, of suitable strength (say ½ to 1½ deg. Tw.).

Old and Modern Bleaching Colors

In former days, before the introduction of the vat colors, very few dyestuffs indeed could be used which would successfully resist the bleaching operation. Examples were colors of Alizarine class such as the well-known Turkey Red, Alizarine Blue, and Alizarine Lilac. Even Aniline Black, except in certain types of this dyed black, would not to-day when viewed in the light of the fastness of some of the vat dyes be considered as fast to the bleaching operation.

As a class, the vat dyes cannot be considered as fast to bleaching, but from among their number can be obtained a range of shades which will probably meet every requirement. This range was certainly not possible until the vat dyes made their appearance. But even here, while success can be said to have been attained with the advent of the vat colors, yet the actual process of piece bleaching has to be modified somewhat to attain the entire success desired. The colors chosen may be fast to the effect given when subjected to the action of chlorine, but there are other parts of the full process of piece bleaching to which the vat colors succumb more or less seriously. In the kier boiling they have a detrimental property of being stripped to a greater or less extent, or of bleeding on to the white portion of the fabric.

Numerous patents have been taken out and methods suggested for overcoming this serious defect. For some time it was an extremely serious matter, but to-day we have got safely over the difficulty, provided ordinary care be used. The fault was put down to the production of hydrocellulose in the lime boil, the hydrocellulose apparently forming a vat, with the result that the color was discharged from the material or it bled on to the white portion of the fabric near the vat-dyed effect thread.

Prevention of Kier Boil Faults

For the purpose of overcoming the disadvantageous effect which results with these dyes when passing through the kier, an open kier instead of the closed one was employed, soda ash was used in place of the caustic soda, and an addition of suitable salts was made to help in preventing the development of the fault. These salts have been the subject of a large number of patents.

The Badische Company of Germany suggested the use of sodium bichromate (¼ pound to the gallon), which it was recommended should be added to the "bowking" liquor, where the ordinary bleaching method is used, the addition not being necessary when the goods are boiled in the open kier. In German patent, 18,938, Pennington and Byk similarly recommend the use of sodium perborate. The firm of Meister, Lucius & Bruning suggest in German patent 218,254, adding 1 per cent to 2 per cent on the weight of goods, of solid caustic soda, with the addition of 0.2 to 0.5 per cent potassium bromate to the kier liquor. Oxide of manganese and oxide of cerium have been also the subjects of patents, and it was recommended to use them by fixing them on to the goods before weaving the cloth, and alkaline bromate may be added as above in the boiling processes. These substances are removed from the material, after having passed through the necessary operations, by means of acidified sodium bisulphate solution of suitable strength.

The Badische Company took out another patent in which they stated that the use of certain nitro anthraquinone compounds would prevent the discoloration of the whites. The compounds suggested are easily reducible organic compounds; and sodium nitrobenzene sulphonate, or sodium mono- or di-sulphonate of anthraquinone were those recommended for the purpose. (It may perhaps be pointed out at this point that in advising these last-named substances it was mentioned that oxidizing agents such as sodium bichromate and permanganate had been previously recommended, but that these are not satisfactory, since when sodium bichromate is employed chromic oxide is produced, and this colors the material yellow, while when permanganate is employed the material is stained and the complicated process involving the removal of such stains is liable to have a weakening and tendering effect on the fiber.)

The faults which these compounds are intended to obviate, however, are merely imperfections in the vat colors, and although care must be exercised in their employment, yet by watching the operations through which the goods pass every satisfaction can be obtained by using the vat colors as dyes which are fast to bleaching and also to the often severe operations involved in the subsequent laundering and household washing of cotton materials containing colored effect threads, etc.—Yorkshire Argus, Textile Supplement.

THREE NEW INDANTHRENES

Kuttroff, Pickardt & Co., Inc., is circularizing the trade with folders describing three new Indanthrene colors offered jointly by Badische Aniline und Soda-Fabrik, Farbenfabriken vorm. Friedr. Bayer & Co. and Farbwerke vorm. Meister Lucius & Bruning. These products are Indanthrene Brown FFR Paste and Powder, Indanthrene Yellow Brown 3G Paste and Powder and Indanthrene Yellow GF Paste. They are specially suitable for cotton, linen and artificial silk and are said to possess excellent fastness properties in dyeing and printing. The folders describing them give dyeing directions, exhibit the colors on swatch bows and outline their fastness properties.

Dyeing of Cotton Skein Yarn

By Louis J. Matos
National Aniline & Chemical Company

COTTON yarns in skein form are dyed in immense quantities for various purposes, the count of the yarn varying from the highest to the lowest. According to the desired shade, the cotton is previously bleached if for light and bright shades, while it is used in the unbleached state if the desired shade is not to be particularly clear or bright.

The preparatory treatment through which cotton yarn passes consists mainly of a thorough wetting-out for the purpose of facilitating penetration of the dye, besides aiding the color to go on the thread evenly. This wetting-out process is practised in various dyehouses somewhat differently, according to the ideas of the individual dyer, but in the main consists of a boiling in water to which some of the commercial soluble oils are added, afterwards rinsed well, and then made ready for the dye kettle.

In some mills, the skeins are kier-boiled, but this operation is not essential, except when the amount of cotton yarn to be dyed is rather large.

The use of soluble oil for this wetting-out of cotton has for its prime object the solution of the natural fatty and waxy constituents of the cotton fiber, upon which it acts quickly, leaving the cotton in a very free and clean condition. The usual amount of soluble oil may vary from 2½ to 4 per cent of the weight of the cotton, and the immersion in the bath is about one-half to one hour. If the dyeing is to be done in one of the present types of rotary skein dyeing machines, the wetting-out is conveniently done in the machine and without additional handling the spent wetting-out liquor is run off, and the kettle filled up for the dyeing, which is proceeded with at once. This method has the advantage that but little time elapses between the wetting-out and the dyeing. Where wetted-out cotton is allowed to lie around in the dyehouse for several hours before being entered in the dye bath, there is a possibility of unevenness showing on the dyed skeins.

Sometimes, where the skein cotton is to be bleached before dyeing, the wetted-out skeins are well washed, and then passed on to the bleach tanks, then washed and dyed.

The general practice for cotton yarns to be dyed with the direct dyes is as outlined above. After the yarn is well wetted-out, the dye bath is prepared with the necessary quantity of dyestuff and common salt; the skeins are then entered, and while the temperature of the bath is gradually raised the skeins are "turned to shade," after which they are lifted out, washed and dried. Of course, where such direct dyes are used as demand either formaldehyde treatment, or diazotizing and developing, the usual procedure for such after-treatments follows in separate kettles.

Much cotton yarn is dyed with the basic dyes, and the preparatory treatment of the skeins requires careful attention from the wetting-out to the final drying. After being wetted-out and washed, the skeins are immersed in a fresh hot bath prepared with the necessary quantity of tannic acid; according to the depth of shade of color desired, the amount of tannic acid will range from 1 to 7 per cent. Immersion in the tannic acid bath may vary from two hours for light shades, eight to ten hours for medium shades, and overnight for heavy shades.

After the cotton has been "tanned" it is lifted from the liquor, squeezed and worked for one-half hour in a fresh bath prepared with a quantity of tartar emetic (or equivalent of one of the soluble antimony salts) corresponding to half the quantity of tannic acid originally taken for the first bath. After this bath, the cotton yarn is well washed, when it is ready for dyeing.

If the skeins are to be dyed in an open hand kettle, the previously dissolved dye is added *in successive portions*, the skeins entered and worked slowly until the bath is exhausted, *and then additional portions of dye added*. The dye is first well wetted and made into a paste with acetic acid, followed by sufficient hot water to affect solution, and then added to the bath as required. The same principle is followed when dyeing cotton skein in rotary machines so as to avoid the possibility of uneven shades resulting.

After dyeing with basic dyes, the practice of after-treating the skeins by again passing them through a tannic acid bath and fixing in a bath of tartar emetic is commonly resorted to. This is for the purpose of increasing the fastness, especially to cross-dyeing. The amounts of tannic acid and tartar emetic employed are usually one-half those originally used for mordanting.

Since clear shades are always desired, every precaution is to be taken that the water employed at every stage is free from iron, because even traces of iron have a distinct "saddening" effect upon colors dyed upon a tannic acid bottom. Unevenness in shades is always likely to occur if the batches of yarn from one operation to another are allowed to lie in heaps in the dyehouse while in a wet condition. They should be expedited without any delays.—Dyestuffs.

Incorporating on a capital of $300,000, the Glasgo Finishing Company of Griswold, has filed certificates with the Secretary of State at Hartford, Conn. The company will manufacture and deal in dyes and bleaches, and will finish cotton, wool, silk and other textile fabrics. The concern will begin business with $150,000. Incorporators are William B. Shaw, of Providence, R. I.; Charles V. James, of Norwich, and Arthur M. Brown, of Griswold.

After-Treatment and Fastness to Light

The Prevention of Oxidation—Combining Fast and Loose Dyes

IN addition to the various methods already discussed for the after-treatment of dyed shades, there are some others of much interest. The case of Primuline after-treated with hypochlorite (or chemic) is of practical as well as theoretical interest. Here we have a canary-yellow color, of poor fastness properties, which by after-treatment with chemic of about 1 to 1½ deg. Tw. is converted into an old gold shade possessing really excellent fast-to-light properties. This after-treatment, in addition to being a process which gives a very fast-to-light shade, yields a dyed result which is also fast to bleaching. Unfortunately, in the improved fastness to light given as a result of this treatment the fastness to washing is not perfected.

The increasing of the fastness of a color as a result of after-treatment with chemic is again illustrated in the case of the after-treatment of certain vat greens, of which Indanthrene Green B was the first example. In the process of after-treatment, however, the shade of the dyed material is totally changed from a green to a dark gray or black, The shade given is exceptionally fast, particularly to bleaching, as is to be expected from the type of after-treatment. In contrast with the old gold shade obtained with the Primuline and hypochlorite, which is relatively cheaply produced, the dark slate or black given with the vat dyestuff from the green is very costly to produce.

Prevention of Oxidation

In a recent issue of the Textilberichte there is an interesting method given by Dr. H. Kraehenbuehl before the Chemiker-Koloisten Verein. He pointed out the case of sulphites, which in the presence of turpentine oil are converted into sulphate, the oil of turpentine acting as a carrier of oxygen. The author asks: "Are there not substances which can be added which will prevent oxidation taking place?" As an example, the aldehyde, acrolein, may be taken and by the addition of a phenol of high hydroxy content, such as hydro-quinone, oxidation can be prevented or resisted. The compound resorcin is scarcely so effective as the hydro-quinone. Bizioli has applied this method to dyestuffs with a view to the prevention of oxidation and with certain dyestuffs at any rate has attained a measure of undoubted success. Among wool colors, Eosine and Erythrosine may be cited, to which can be given a resistance to oxidation by after-treating suitably with the compounds of the type suggested. It was seen that shades of these after-treated colors, which had been exposed for some fourteen days to the light, were not nearly so faded as dyeing with the same colors which had only been exposed half the time. Many Benzidine dyestuffs of the direct class, such as Benzo Azurine (By), Dianil Blue (M. L. B.), and Congo colors showed similarly beneficial effects.

The author employed in the case of wool a 1 per cent solution of hydro-quinone sulphate, with which he treated the material for forty-five minutes, at 80 to 90 deg. (say, 3 per cent of the substance on the weight of the wool).

In the case of cotton he took 1 per cent of the hydro-quinone and worked cold, squeezed and dried.

The tests have not been carried further, but they are at any rate of much interest. Exception may be taken on theoretical grounds to the universal adoption of the principle of the method, which is that so long as oxidation is prevented we shall prevent a dyed shade fading. We have already seen, however, that on careful consideration the fading of dyed shades cannot be put down to a universal oxidizing action. In certain cases, however, it may be the cause, and in such cases perhaps the suggestions which Kraehenbuehl brings forward for after-treatment to prevent oxidation may apply successfully. The ideas are certainly of valuable theoretical interest.

Combining Fast and Loose Dyes

Another improvement in the fastness of dyestuffs, which is of rather peculiar interest, is seen in the case of certain dyes which are by no means of a fast type, but which when combined with certain other colors are made fast; or at any rate the combination of a fast or reasonably fast color with the dyestuffs in question (which are not fast) yields a combined result which gives no cause for complaint. In the dyeing of cotton such a case is seen in that early discovered vat color Anthraflavone, which cannot be considered anything but poor to light. If this is combined with certain other vat dyes, notably certain blues, to give a green shade, the last-named is very fast indeed. Among wool colors there are certain neutral dyeing wool colors which are only poor in light fastness but which when used for brightening of certain chrome navy shades give a combination which is very fast indeed to light action. Evidently some chemical combination takes place in such cases whereby the resulting chemical compound (the dyed shade) is considerably faster than the original loose constituent. The combinations between the loose dye and the faster ones are only possible between certain of the faster colors and the loose one. It certainly seems as if more use could be made of these combinations than is done at present.—Yorkshire Argus, Textile Supplement.

C. C. Concannon, of the Chemical Division, Department of Commerce, has been designated to succeed F. R. Eldridge, chief of the Far Eastern Division of the department on the interdepartmental committee of experts advisory to the Federal Narcotics Control Board. The board enforces the Jones-Miller law applying to imports and exports of narcotics.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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CO-OPERATIVE TEXTILE RESEARCH

DURING recent years it has been brought home forcefully to executives of industries of all types that industrial research must play an extremely prominent part in their scheme of things if their respective industries were to advance in keeping with the steady march of progress set by the world at large.

The textile industry is no exception. Repeatedly in these columns we have called attention to the necessity for intensive textile research and numberless speakers and writers have expounded the same idea. There is no apparent diversity of opinion upon the advisability of intensive textile research as an abstract proposition. There is, however, a most lamentable disposition on the part of many leaders of the industry to "let George do it." The mind of the American industrialist does not take kindly to abstract research; he wants concrete developments. The inventor of a new or improved process or device will find no difficulty in marketing his invention and his services at a most satisfactory figure, but there is comparatively little disposition on the part of capital to finance a group of technical students through years of patient research in the hope that they may eventually unearth something of advantage to the industry as a whole.

In this respect we are woefully short-sighted. European nations—particularly Germany and England—appreciate to the full the value of abstract research and their universities, and industrial laboratories are well supplied with earnest students supported by fellowships of one kind or another.

It is earnestly to be hoped that the coming years will witness a change of attitude on the part of American capitalists in this respect, especially those who control the destinies of the textile industry, in which, of course, we are primarily interested. A very trifling percentage of the gross earnings of our textile corporations, if applied to co-operative research, would, in the long run, yield fruits out of all proportion to the expense involved.

THE TEXTILE ALLIANCE, INC., AS A RESEARCH PATRON

IN line with the thought expressed above it is pertinent to call the attention of our readers to the fact that there exists at the present time a fund approximating two millions of dollars which would be available for textile research were it not for an incomprehensible attitude on the part of the Federal Government. We refer to the funds now in the hands of the Textile Alliance, Inc.

This organization was incorporated under the provisions of the Membership Corporation Law of the State of New York mainly for the purpose of the protection of mill owners and operators, and the prevention and reform of abuses, in the manufacture and sale of mill supplies and the prosecution of crimes in connection therewith. It had no stockholders, and under the law of New York it was a non-profit making organization, and no part of its net earnings could inure to the benefit of any private individual. It was essentially a trade organization, and after the outbreak of the European war all of its operations were conducted on behalf and as a conduit for the members of its associated organizations in connection with the importation of wool, dyes and other essential commodities, and after the United States entered the war the Alliance acted as a quasi-Government agency.

In the course of its dye operations, acting on behalf of the Department of State, the fund above mentioned was accumulated, the greater part of which under agreement with the Department of State was to be devoted to scientific research and educational purposes.

A substantial part of this fund will be available for this purpose were it not for the fact that the Treasury Department of the Federal Government has seen fit to lay claim, under the Income and Excess Profits Tax Law, to approximately one and one-quarter millions of dollars of the fund.

In other words, the Government in this instance treats the Textile Alliance as if it were a privately owned stock corporation organized for profit and conducted for the purpose of making profit for stockholders.

The Textile Alliance is contesting this claim of the Treasury Department, and hopes eventually to sustain its contention that it is an exempt corporation, and that the funds accumulated do not constitute gain or profit and are not, therefore, subject to income and excess profits taxes.

Should this contention be sustained the fund in question, subject to further action by Congress, may become available for scientific research and education.

While this controversy is being carried on between the Government and the Textile Alliance it would be well for all persons interested in the promotion of textile research to bring to bear any influence which they may possess in an effort to induce the Government to take a reasonable attitude. It seems utterly ridiculous that the Treasury Department should lay claim to funds which could be used so advantageously for a purpose unquestionably beneficial to the nation as a whole and to the textile industry in particular.

THE GENERAL DYESTUFF CORPORATION

THE announcement elsewhere in this issue of the taking over, as of October 1st, of the sales division of the Grasselli Dyestuff Corporation by the General Dyestuff Corporation, is extremely interesting, although not entirely unexpected. With the addition of the Grasselli line, the General Dyestuff Corporation now controls the sale in America of the products manufactured by three of the leading German companies. It is generally expected in the trade that a further consolidation, to be effected in the near future, will place the products of a fourth—and possibly largest—German manufacturer in this category.

In these columns we have in the past repeatedly urged upon American manufacturers, particularly the smaller manufacturers, the desirability of consolidating their manufacturing and sales efforts with the obvious advantage of reducing overhead expense. H. A. Metz, president of the General Dyestuff Corporation, is to be congratulated upon his present accomplishment. The move is fundamentally sound and shows excellent common sense.

The REPORTER'S opinion of the effect of this combination of importing interests is that it will prove beneficial to many parties and harmful to none. We believe that the net profit of the merged organization will be materially greater than the combined net profits of the constituent companies, this increase being effected primarily through the reduction of overhead and, to a lesser extent, by reduced manufacturing costs. We believe that the decreased costs and overhead will permit the combined organization to sell profitably at somewhat reduced prices, thereby benefiting consumers. We do not believe, however, that the gross business of the combination will be as great as the gross business of the individual constituents. In other words, it seems to us unlikely that one sales organization can sell as great a volume of goods as two, three or four. And it is at least certain that the struggle to obtain every bit of available business by a number of directly competing firms will be modified by just the extent to which individual competitors are eliminated from the field.

Our feeling is, therefore, that American dyestuff manufacturers have little occasion to fear or even regret this combination. Even though every importing interest in the country were merged into a single sales organization, the tariff would remain as it is and the same duties would be paid by the combined organization as by the various individuals. If, as seems probable, additional colors, which are at present imported, shall come to be manufactured by the combination in American plants under its control, we still see no grave cause for alarm. Admitting the superior technical ability of foreign manufacturing chemists who may be imported—an ability by no means inherent, but acquired through more years of experience and, consequently, a steadily decreasing factor—other other manufacturing costs on goods made in America will be no less for the General Dyestuff Corporation than they are for other American manufacturers. Hence, we feel that while there will possibly be more efficient competition from a single source, there will also be fewer competitors and that the disadvantages of the one will be offset by the advantages of the other, so far as American concerns are affected.

THE CHEMICAL EXPOSITION

Covering nearly the entire floor space on three of the spacious floors of the Grand Central Palace in New York, the Tenth Exposition of Chemical Industries was without question one of the most spectacular all-around industrial shows that have ever been held.

More than three hundred exhibitors displayed their products, processes and services to the crowds of manufacturers, engineers, chemists and other technical men, and to the general public that thronged the aisles and filled the booths during every afternoon and evening last week. It was an exposition that could not but impress every visitors with its color, its brilliance and its movement, and, finally, with its colossal presentation of what has been so far achieved in the mechanization of the chemical industry.

Of the exhibits, chemical equipment and chemical machinery in operation formed probably nine-tenths of the products displayed. There was booth after booth of separators, pulverizers, mixers, sifters, crushers, dryers, centrifugals, valves, stoneware, glassware, metal piping, optical instruments, temperature recorders and laboratory apparatus. As a display of remarkable mechanical equipment the Chemical Show was a decided success.

During the week of the Chemical Exposition a comprehensive prearranged program of technical lectures, educational motion pictures, association meetings, conferences and banquets was carried out under the supervision of a number of chemical organizations.

The National Association of Finishers of Cotton Fabrics held a meeting on Tuesday, September 29, at the Hotel Roosevelt. Dr. Charles H. Herty addressed this body on "Control of Dye Purchases by the Textile Industry," G. J. Esselen, Jr., spoke on "Artificial Silk and the Textile Industry," and J. Douglas MacMahon dealt with "Liquid Chlorine and Its Uses in the Textile Industry."

The Court of Chemical Achievement, on the third floor of the exposition, drew considerable interest from both technical men and casual visitors. Here were displayed those products which, in the judgment of a specially appointed committee of the American Chemical Society, were particularly noteworthy accomplishments in the progress of the American chemical industry. In this court E. I. du Pont de Nemours & Co. displayed several of their recent fast vat dyes, Ponsol Golden Orange G and 2RT in the Ponsol series, Sul-

phanthrene Pink FF, the Gallopont colors and the Luxol colors.

The Rayon Exhibit

A section of the exposition that was far more attractive to the general public than the Court of Chemical Achievement, and which held the interest of every textile and dyestuff man that visited the show, was that devoted to an exhibition of "Chemistry's Contribution to the Textile Industry." Here artificial silk was displayed in all its various forms, from the raw product to the finished fiber, the finished piece goods and the finished garment, together with the machinery with which the fiber is manufactured. Three representative artificial silk manufacturing companies and one well-known machinery concern co-operated in this notable display of the most widely discussed textile product: the American Cellulose & Chemical Manufacturing Company, the Industrial Fiber Company, the Tubize Artificial Silk Company of America and the Max Ams Chemical Engineering Corporation.

The American Cellulose & Chemical Manufacturing Company, makers of Celanese, exhibited a colorful array of garments and piece goods made all or in part of Celanese. The feature of this display was a draped figure wearing a shimmering gown of white Celanese satin; the wall behind this figure was hung with a brilliant brocade tapestry of gold and blue that had been dyed in one bath with SRA colors. The gold was of Celanese, the blue of cotton. Another feature of special note was piece goods of *printed* Celanese, a new development in the use of the SRA dyes in conjunction with this fiber. A recent Celanese product also displayed was a cotton-Celanese velvet dyed in various hues.

The manufacturers of Celanese have just issued a new color card showing the full range of SRA dyes for Celanese brand yarns, fabrics and garments. The card shows, in addition to dyed swatches of Celanese, swatches of cotton that was dyed in the same bath. This cotton is in every case either pure white or slightly stained, as the SRA colors have no affinity for this fiber. The SRA dyes were exhibited at the booth of the American British Chemical Supplies, Inc., formerly selling agents for the SRA series of dyestuffs, but the color card was distributed from the booth of the American Cellulose & Chemical Manufacturing Company, with two other new booklets entitled "Notes in the Practical Dyeing of Celanese" and "Notes on the Treatment and Dyeing of Celanese by the Garment Dyer."

The Industrial Fiber Company devoted its space to a unique educational exhibit of the chemicals and raw materials that enter into the manufacture of its particular type of artificial silk, a viscose product. Here one could trace each distinct step in the development of the raw product into the finished rayon. A number of dyed piece goods and garments of "Industrial" rayon were also displayed.

At the Tubize booth, located in this section, the nitro-cellulose or Chardonnet type of artificial silk was attractively exhibited as dyed skeins, piece goods and garments.

The following are brief descriptions of a few of the exhibits that were of particular interest to the dyestuff and textile industries:

The International Nickel Company, New York, displayed a variety of Monel-metal products used in the chemical industry—piping, containers, kettles and similar equipment.

The Tolhurst Machine Works, Troy, N. Y., occupying spaces 68 and 69 on the first floor, exhibited several types of Tolhurst extractors and other chemical machinery.

Fletcher Works, Inc., Philadelphia, in space 58, had on display one of its large underdriven centrifugals used in chemical manufacturing processes.

In the booth of the Tagliabue Manufacturing Company, Brooklyn, N. Y., a full line of Tag temperature indicating and controlling instruments was exhibited. A detailed description of this display appeared in a previous number.

The Taylor Instrument Companies, Inc., Rochester, had on display a variety of their industrial thermometers used in the temperature and pressure control of chemical processes.

At the booth of the Emil Greiner Company the main feature was the Mowen Multiple Unit Thermostat Bath for Saybolt Viscosity Tubes, used particularly in oil-testing laboratories. In addition, there was an attractive display of equipment for the general chemical laboratory.

The Mathieson Alkali Works, Inc., New York, occupying a large, beautifully decorated space equal to the area of four booths, exhibited samples of its chlorine, caustic soda, bleaching powder and similar alkali products.

THE CHEMICAL INDUSTRIES DINNER

More than five hundred men of the American chemical industry and their guests attended the Fourth Annual Chemical Industries Dinner in the ballroom of the Hotel Roosevelt, New York, on Thursday evening, October 1. Nearly all of the distinguished and important personages in the chemical industry of this country were present. Eighteen chemical associations co-operated in making this huge banquet a far greater success than its predecessors.

Dr. Charles H. Herty, president of the Synthetic Organic Chemical Manufacturers' Association, presided as toastmaster at this impressive gathering of his colleagues and fellow workers. In this capacity he fittingly introduced each of the two prominent

speakers of the evening, United States Senator James W. Wadsworth, Jr., and Lawrence F. Abbott, contributing editor of The Outlook. Other guests at the speakers' table included E. J. Barber, Elon H. Hooker, Arthur D. Little, Col. C. D. Brigham, James F. Norris, Milton C. Whittaker, Herbert H. Dow and Williams Haynes. Regret was expressed by Dr. Herty that neither Francis P. Garvan nor Brigadier-General Amos A. Fries were able to be present.

Senator Wadsworth, who is chairman of the Senate Military Affairs Committee, declared that he regarded as the two most important and outstanding developments in the advance of the American chemical industry the organization and work of the Chemical Foundation and the passing of the Tariff Act of 1922.

He spoke at some length on the significant position which chemical warfare has assumed in international relations, and in particular of the Chemical Warfare Service of the United States, stressing the obvious and incalculable importance of this division of our military defense and deploring the extreme restriction of its appropriations. Though, he said, action has been taken among the nations of the world to suppress and outlaw the use in war of poison gas and other chemicals, he expressed strong doubts that any agreement of this nature would stand inviolate if these nations actually engaged in combat.

One interesting observation he made was to the effect that Congress, in working for legislation in the interests of the American chemical industry, is sorely handicapped by its lack of definite and practical knowledge regarding the industry and its requirements. The education of Congress in this respect, he believed, was of paramount importance if our chemical industry desired adequate protection.

Lawrence F. Abbott took as his subject the inspiring life of the great scientist Louis Pasteur.

A varied and entertaining program of music was furnished during the dinner.

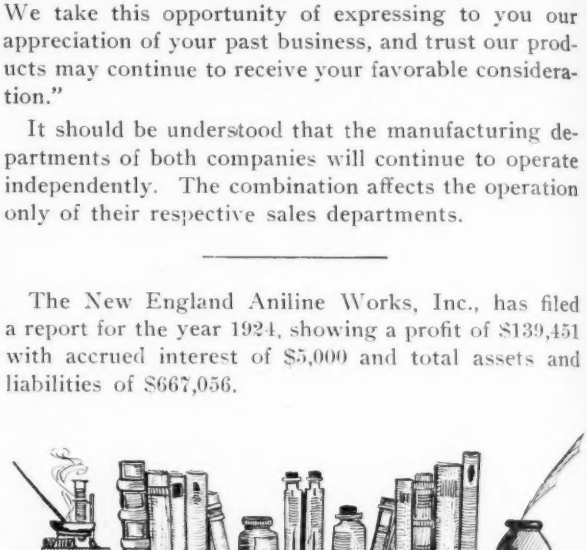
GENERAL DYESTUFF TAKES OVER GRASSELLI SALES

The General Dyestuff Corporation, formerly the dyestuff department of H. A. Metz & Co., announced on October 1 that after that date its sales division would handle all orders for dyestuffs manufactured or imported by the Grasselli Dyestuff Corporation. The latter concern confirmed this amalgamation simultaneously, but stated further that it will fill all existing orders and continue shipments on all existing contracts. The sales personnel of both corporations will consequently be combined.

The announcement from the General Dyestuff Corporation reads: "This is to advise you that we are now prepared to execute promptly orders received for the products manufactured by the Grasselli Dyestuff Corporation. We respectfully solicit your inquiries concerning these goods." That from the Grasselli Dyestuff Corporation states: "From this date the goods manufactured by us will be sold by the General Dyestuff Corporation. We will, however, execute existing orders and continue shipments on existing contracts. We take this opportunity of expressing to you our appreciation of your past business, and trust our products may continue to receive your favorable consideration."

It should be understood that the manufacturing departments of both companies will continue to operate independently. The combination affects the operation only of their respective sales departments.

The New England Aniline Works, Inc., has filed a report for the year 1924, showing a profit of $139,451 with accrued interest of $5,000 and total assets and liabilities of $667,056.



RECENT LITERATURE

Fastness of Dyes on Silk. British Silk Research Association. 24 pages. $2.50.

A technical treatise described by the Silk Association of Great Britain and Ireland as "an important report issued by our Research Laboratory" and "the result of an enormous amount of work, investigation and experiments extending over a very long period." It contains proposed standards for fastness to light, water, washing, degumming and perspiration and a classification of a number of dyes according to their fastness with reference to these standards.

New Bedford Textile School Catalogue, 1925-1926. Fifty pages. Illustrated.

An interesting, well-illustrated catalogue giving complete general information about the New Bedford School and outlining in detail all of its courses in general cotton manufacture, chemistry, dyeing and finishing, designing, carding, spinning and knitting. The various departments are shown in the illustrations. An alphabetical list of its graduates is given with occupations and addresses.

Indicating Thermometers. Bulletin No. 148. The Foxboro Company, Inc. 36 pages. Illustrated.

A catalog fully illustrated with photographs and diagrams, describing in detail the various types of Foxboro indicating thermometers, showing representative installations and giving specifications and prices of bulbs and other parts.

TWO NEW DU PONT COLORS

The Dyestuffs Department of E. I. du Pont de Nemours & Co. announces that a new dye to be offered under the name of Pontamine Fast Orange 2G Concentrated (Patent applied for) has just been developed in its research laboratories. It is a direct orange characterized by brightness of shade, fastness to washing and dischargeability.

It can be used on all types of circulating machines as well as on the padder and is, therefore, suitable for use on cotton in any stage of manufacture where the best types of direct colors are required.

Pontamine Fast Orange 2G Concentrated can be diazotized and developed without change in shade of properties, the characteristic possessed by but few direct colors. It leaves Celanese effects white.

This company also announces an addition to its line of Pontacyl colors, Pontacyl Green NV Concentrated, a green chiefly of interest to the woolen trade and especially to those manufacturing dress goods.

It is an acid color which is used almost entirely on ladies' dress goods for the production of navies with a very good overhand; not only because it levels so well that it can be added to the boiling bath, but also because it turns yellower in artificial light and, therefore, corrects the fault of many acid violets and blues, used in such combination, which turn red under this influence.

Pontacyl Green NV Concentrated leaves cotton, rayon and Celanese effect threads exceptionally clear when dyed in an acid bath.

NEW GRASSELLI PRODUCTS

Grasselli Dyestuff Corporation recently issued to the trade folders and announcements describing several new dyestuffs and textile chemicals, products of Farbenfabriken vorm. Friedr. Bayer & Co. These include a finishing and printing compound, Sericose, used with a new solvent, Enodrine; a water-insoluble color, Reflex Blue K; two Benzo Fast Copper Colors, Blue B and Violet B; Supramine Blue FB; two new vat colors, Indanthrene Brown FFR Paste and powder and Indanthrene Yellow Brown 3G paste and powder, and an assistant in the control of the dye vat, Indanthrene Yellow Test Paper.

Sericose is used in a permanent finishing process to obtain a filling up and stiffening effect on such goods as cheese-cloth, shirtings, satins, etc. A Sericose-Enodrine solution can be printed on in a concentration of nine parts Sericose LC Extra to one hundred parts solution, or in a more diluted manner with additional quantities of Enodrine and water. The finish will then change accordingly to a very mild one. The description states that tests have shown that this finish stands up well against lukewarm washing and soaping.

Reflex Blue K is a product of interest to makers of printing and lithographing inks. It is a water-insoluble color belonging to the "Toner" class. Its fastness to light is said to be better than that of Victoria Blue or Methyl Violet Toners. It also differs from these products by the bronzy print which it produces and which gives it its name. It is soluble in alcohol and other spirit solvents.

Benzo Fast Copper Blue B and Violet R are described as the first representatives of a new class of dyestuffs that has just been placed on the market. Their correct shade and properties are obtained by an after-treatment with copper. Unlike other colors these new types, it is claimed, are rendered permanently fast to washing, and in this respect are considered as good as the better class of developed colors after these have been soaped at the boil. Consequently, by a very simple after-treatment the same fastness is obtained as with the diazo colors, by diazotizing, developing and soaping.

Supramine Blue FB is said to be of exceptional brightness and shows all the fastness properties of its class; it is described as possessing excellent fastness to light, salt water, perspiration, steaming, washing and boiling water. It is further said to be very level dyeing. This color is of particular interest for silk and wool knitting and sewing yarns, bathing suits and hats.

Indanthrene Brown FFR paste and powder and Indanthrene Yellow Brown 3G paste and powder are two new vat dyestuffs yielding the best results when applied by the process described in the circular regarding them. Both colors are said to level very well and to produce shades of excellent all-round fastness. The brown is considerably clearer and somewhat redder than the well-known R brand. Both of these Indanthrenes are useful for dyeing fast shades on cotton, linen, half-linen and artificial silk. They are also suitable for silk dyeing. The powder form in both cases is eight times stronger than the paste.

Indanthrene Yellow Test Paper, described as an assistant in the control of the dye vat, is treated in a special folder, which states that this test paper is used to ascertain the amount of hydrosulphite present in the dye bath. When dipped for three seconds into a freshly prepared caustic soda-hydrosulphite-indanthrene liquor the paper assumes a cornflower blue shade. If the bath is tested twenty minutes after the commencement of dyeing and the change to blue takes place only after six seconds it is advisable to add to the liquor four to five ounces of hydrosulphite per one hundred gallons. The Indanthrene Yellow Test Paper, therefore, usually assists the dyer to determine the hydrosulphite additions which are actually required. The folder describes several practical examples to show the value of this unique product.

A new company has been incorporated under the name of the Brooklyn Textile Dyeing Company Inc., which has purchased all the machinery, equipment, stock and fixed assets of the Brooklyn Finishing Company, located at the Bush Terminal, Brooklyn, N. Y. All the stock of the new company is owned by the incorporators, E. C. Myrick, M. D. Myrick and G. E. Williamson. Its officers are Eugene C. Myrick, president; M. D. Myrick, vice-president, and G. E. Williamson, treasurer and secretary. The firm of Myrick & R. D. Rice, 320 Broadway, has been appointed their agents.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

SULPHUR BLUE BC

(Schultz No. 728)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Glauber salt and soda, and very little sulphide at 90 deg. Fahr.

SHADE: Very clear shade of blue, rather reddish.

SHADE BY GASLIGHT: Duller.

SOLUBILITY: Moderate.

LEVEL: Does not dye level.

EXHAUSTS: Poorly.

FASTNESS TO:

Acid: Redder with sulphuric; fast to acetic.
Alkali: Fast.
Boiling: Moderate.
Chlorine: Inferior to S-659.
Cross-Dyeing: Moderate; loses shade and bleeds into wool.
Fulling: Fast.
Ironing: Fast.
Light: Very moderate; inferior to Methylene Blue (S-659).
Perspiration: Fast.
Rubbing: Fast.
Washing: Excels S-659.

DYED BY OTHER METHODS: After-treated with chrome and copper, faster to light and duller.

PRINTING: Good with sulphide.

DISCHARGING: Discharges clear white easily with chlorate of alumina.

COMPETING PRODUCTS: Made in the United States by Grasselli Dyestuff Corporation.

KATIGEN INDIGO R

(Schultz No. 733)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Same amount of sulphide as color, soda ash and a little salt.

SHADE: Red shade of blue.

SHADE BY GASLIGHT: Duller.

SOLUBILITY: Excellent.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Moderate.
Alkali: Fast.
Boiling: Fast.
Chlorine: Very moderate.
Ironing: Fast.
Light: Very good, especially in light percentage.
Washing: Moderate.

DYED BY OTHER METHODS: Adapted for the production of red shade Indigo tones. It does not require after-treatment when it is dyed without being kept immersed, wrung out and the goods allowed to hang about an hour. This also applies to the product when used in the jig. The goods are allowed to run for half an hour on the two upper rollers, then rinsed. The pieces will be free from lists.

PRINTING: Gives a good discharge only with chlorate of potash.

COMPETING PRODUCTS: Made in the United States by Tower Manufacturing Company, under name of Indophenol Blue R Conc.; National Aniline & Chemical Company, under name of Sulphindone Blue B; Holland Aniline Company, under name of Sulphur Blue.

INDOPHENOL SKY BLUE

(Schultz No. 735)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Glauber salt and sulphide.

SHADE: Indigo shade of blue.

SHADE BY GASLIGH8: Duller.

SOLUBILITY: With difficulty.

LEVEL: Does not dye level.

FASTNESS TO:

Acid: Moderate.
Alkali: Fast.
Boiling: Fairly good.
Ironing: Fast.
Light: Moderate.
Perspiration: Fast.
Rubbing: Crocks.
Washing: Fast.

OTHER PROPERTIES: Better solubility than S-728.

COMPETING PRODUCTS: Made in the United States by Tower Manufacturing Company.

SULPHUR GREEN

(Schultz No. 746)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Sulphide soda, ash and salt.

SHADE: Dull bluish shade of green.

SOLUBILITY: Fair with sulphide.

LEVEL: Fairly level dyeing, even in light percentage.

EXHAUSTS: Well.

FASTNESS TO:
- **Acid:** Fair.
- **Alkali:** Fast to ammonia; duller with soda.
- **Boiling:** Moderate; shade goes bluer and duller.
- **Chlorine:** Poor.
- **Cross-Dyeing:** Moderate; shade goes bluer and duller.
- **Ironing:** Yellower.
- **Light:** Moderate.
- **Potting:** Bleeds.
- **Rubbing:** Crocks slightly.
- **Sulphur:** Fairly good.
- **Washing:** Fast.
- **Storing:** Good.

OTHER PROPERTIES: Goes very dull on after-treating with chrome and copper. Properties not improved.

DYED BY OTHER METHODS: Topped with nickel sulphate at 190, very little change in shade; faster to washing. Topped with copper, goes much bluer and somewhat faster to light.

PRINTING: No interest.

DISCHARGING: Chlorate discharge good.

COMPETING PRODUCTS: Made in the United States by Amalgamated Dyestuff & Chemical Works, Inc. (Selling Agents, John Campbell & Co.), under name of Amalthion Green 2G; Tower Manufacturing Company, under name of Indophenol Green; E. I. du Pont de Nemours & Co., under names of Sulphogene Brilliant Green 2G, Sulphogene Green 2B and Sulphogene Green M Conc.; Holland Aniline Company, under name of Sulphur Green; National Aniline & Chemical Company, under name of Sulphur Green T.

HYDRON BLUE

(Schultz No. 748)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Hydrosulphite vat at 140 deg. Fahr.

SHADE: Bright pure blue. Duller than Indanthrene; brighter than Indigo.

SHADE BY GASLIGHT: Greener.

SOLUBILITY: Good.

LEVEL: In light and medium percentage, good. Bronzy in heavy shades.

FASTNESS TO:
- **Acid:** Fast.
- **Boiling:** Superior to any of the Katigen Indigos.
- **Chlorine:** Superior to Indigo. Type for Class 4 (German classification).
- **Cross-Dyeing:** Superior to the Katigen Indigos.
- **Fulling:** Fast.
- **Light:** Better than Indigo. Inferior to Indanthrene Blue GC.
- **Rubbing:** Superior to Indigo.
- **Washing:** Goes redder and bleeds in boiling water.

MACHINE DYEING: Can be dyed in a jig with squeeze rolls.

DYED BY OTHER METHODS: Brighter when after-treated with peroxide or perborate.

ON OTHER MATERIALS: Not suited.

PRINTING: The direct prints are weak but fast to boiling.

COMPETING PRODUCTS: Made in the United States by E. C. Klipstein & Co., under name of Dynon Blue R; E. I. du Pont de Nemours & Co., under names of Sulphanthrene Blue G and GR.

SULPHOGENE GOLDEN BROWN R

(Schultz No. 750)

SPECIALLY SUITABLE FOR: Cotton, linen, jute.

USUAL METHOD OF DYEING: With the same to double the amount of sulphide as color, and 5 to 8 per cent soda and 10 per cent salt.

SHADE: Bright yellowish brown.

SHADE BY GASLIGHT: Little change.

SOLUBILITY: Good with plenty of sulphide.

LEVEL: Fair.

FASTNESS TO:
- **Acid:** Good even with mineral acids.
- **Alkali:** Fast.
- **Boiling:** Fast when after-treated with chrome and copper.
- **Chlorine:** Destroyed.
- **Ironing:** Fast.
- **Rubbing:** Crocks.
- **Washing:** Very good, especially when after-treated.
- **Storing:** Good.

OTHER PROPERTIES: The after-treated shade with chrome alone is somewhat fuller and with copper alone somewhat duller.

DYED BY OTHER METHODS: Dyes cold very well. Needs more salt to exhaust when dyed cold. For 40 per cent color use 75 per cent salt. Rinse well. On cotton plaited with white wool and then cross-dyed acid the color bleeds onto the wool.

ON OTHER MATERIALS: Suitable for linen, jute and artificial silk.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co.

(Continued on page 689)

Technical Notes from Foreign Sources

Dyeing and Printing Nitroso Blue

The usual gray tone of nitroso blue, which is obtained by means of nitrosodimethylaniline and resorcinol, is avoided, and a brighter blue shade is obtained by the addition of gallamide to the printing or padding liquor. The gallamide is employed in the form of its sodium salt.

A suitable padding liquor contains 2,500 grams of nitrosodimethylaniline, 1,320 grams of hydrochloric acid, 960 grams of oxalic acid, 3,200 grams of resorcinol, 800 grams of gallamide, 500 grams of caustic soda of 40 deg. Be. concentration (density 1.38) and 600 grams of sodium phosphate. The solutions of these various constituents are mixed together in the cold, and particularly good agitation is employed during the addition of the sodium phosphate and gallamide. Colored resists similar to those employed for aniline black may be used.

Gallamide may be replaced by gallic acid methyl ether or gallic acid, prune (pure) and gallocyanine being formed respectively by their combination with nitrosodimethylaniline. It is pointed out that this method of brightening nitroso blue by the formation within it of a small quantity of prune (pure) is a useful alternative to the usual process of topping with members of the substantive class of coloring matters.

(For further details see Bulletin Societe Industrielle Mulhouse, 1925, Vol. 91, pp. 43-44.)

Dyeing Jute

While it is generally the practice to dye the jute yarn after it has been spun, according to the new process which is patented in German Patent No. 401,631 the jute fibers are colored before being carded, after first being given the usual preliminary treatments of washing with water, softening and squeezing. When the process of dyeing jute is carried out in this manner, the cost of the operation is materially reduced; for in this case it is only necessary to add the coloring matter to the liquor employed in softening the fibers, and the dyeing is then carried out without any further difficulty. In the new process the various machines, such as the carding machine, the preliminary and fine spinning machines, etc., remain unchanged in any manner. The squeezing to which the fibers are subjected has the effect of causing better penetration of the coloring matter into the internal structure of the jute fibers.

Ignition of Textile Fibers

In the German magazine Spulen und W., 1925, pp. 5-8, there is contained an interesting account of a number of experiments made to determine the conditions under which various textile fibers become overheated and ignite. What is referred to is spontaneous combustion of the fibers when they have been impregnated with fatty substances. These substances are finely distributed throughout the fiber and strongly pressed into them.

The clean unloaded fibers do not heat up. The spontaneous combustibility of the fibers depends on the ease with which they store up heat, and is therefore inversely proportional to the rate at which heat is conducted by the fibers. Furthermore, the spontaneous combustibility of the fibers is dependant on the structural composition of the fibers, their content of moisture, their behavior toward fatty and oily substances, their tendency to form dust, the electrical properties of the fibers and other factors.

Vegetable fibers withstand temperatures of 100 to 105 deg. Cent., wool 110 deg. Cent. and unloaded silk 120 deg. Cent. The weighting of the silk results in an increase in the combustibility of the fiber. In the case of greased wool the vegetable oils are more dangerous than the mineral oils. Nitro-silk is the only one of the artificial silk fibers that is easily combustible.

Fast Shades on Fabrics

Textile materials which are dyed with the aid of azo dyestuffs, which are produced by coupling tetroazotized 4-4' diaminodiphenyl-3:3' dicarboxylic acid with, for example, one molecule of acetyl ortho chloroanilide and one molecule of 1-amino-8-hydroxynaphthalene-4-sulphonic acid or one molecule of phenyl-bete-naphthylamine and one molecule of resorcinol, are afterward coppered, yielding shades which are fast to light and to washing. (German Patent No. 410,758.)

Dyeings by Oxidation

Diaminoazobenzene compounds, such as chrysoidine or Bismarck brown, are treated in solution with the aid of an oxidizing agent, such as potassium chlorate, in the presence of an aromatic diamine or an aminophenol. These substances act as oxygen carriers and also enter into the formation of the product. The material that is to be treated is dipped directly in the resulting solution and is dyed deep fast brown colors. (German Patent No. 410,241.)

Dyeing Acetyl Cellulose

The addition of the salt of an oxyacid acid of nitrogen or chlorine to the dye bath increases the absorptive capacity of an acetylcellulose for basic coloring matters and enables very deep shades to be obtained. For example, cellulose acetate artificial silk is dyed for a

period of thirty minutes at a temperature of 70 deg. Cent. in a dye liquor which contains 1 per cent of Chrysoidine G Extra, 5 parts of aniline nitrate and 1,000 parts of water. The aniline nitrate may be replaced by magnesium, ammonium, sodium, calcium or zinc nitrate, or by the nitrate of another organic base, such as monomethylamine, dimethylamine, guanidine, pyridine and piperidine. Crystal Violet P, Methylene Blue, Safranine, Rhoduline Red B, Auramine and Bismarck Brown may be used in this process.

Weighting Artificial Silk

It is possible to obtain a pure white artificial silk fabric by weighting the fibers with the salts of the metal lanthanum and others of similar properties. During the process the solutions may be heated. (For further details see German Patent No. 411,265.)

Spontaneous Combusion of Cotton

Numerous experiments and investigations have been made for the purpose of determining the initial cause of the spontaneous combustion of cotton. In general, it has been held that an oxidation of the oils that are contained in the cotton takes place and the heat evolved by the chemical reactions gradually raises the temperature of the cotton to the ignition point.

An entirely new theory has been developed by Andre Dubose, who says that the evolution of heat is brought about by the action of an enzyme, lipase. A long list of enzymes were investigated, the ones that occur in vegetable or animal bodies being selected. Lipase is such an enzyme, which owes its existence to the action of bacteria, which live in the slimy and nitrogen-containing parts of the cotton plant.

Lipase has the power of splitting fatty substances, which is an exothermic reaction, resulting in the evolution of a large amount of heat. While the bacteria which produce this enzyme develop best at a temperature of 25 to 30 deg. Cent., and are killed at higher temperatures, the action of lipase is greatest at a temperature of 35 to 50 deg. Cent., and when the temperature is first raised to 100 deg. Cent., then its activity is negated.

The presence of moisture is the necessary condition for the development of this enzyme. However, moisture is always present in admixture with the fatty substances in the cotton plant, so that all the conditions which are necessary for the development of lipase are present, provided the cotton is not stored in too cool a place.

Thus the action of the lipase is to split the fatty matters that are present in the cotton, and this action results in the evolution of a certain amount of heat. The heat is not dissipated, but stored in the interior of the mass of cotton until the temperature of the cotton fiber is raised to the ignition point. (Soc. Ind. de Rouen, through Deutsche Faerber Zeitung, 1925, 941.)

Improving Vegetable Textile Material

A silky gloss, brilliance and elastic feel are given to woven and spun material of vegetable origin—for example, linen, flax, hemp, ramie, jute, cotton—by treating them in the presence of alkalies with an inorganic ester of a monohydric alcohol, and then subjecting them to stretching. The reagents may be employed either simultaneously or in sequence, and the fiber may be treated at any stage from the crude state to that after the removal of the fatty constituents, or after bleaching, mercerizing, hydrolyzing or gelatinizing (with a strong mineral acid or the like).

The caustic alkalies are preferred as alkalies, but alkaline sulphides may also be used in the process. As esters, dialkyl sulphates, alkyl halides or aralkylhalides are suitable. Alcohol may be added to the alkali in order to assist in the penetration of the fiber and the esters may be used alone or in solution in suitable solvents, such as benzene, alcohol or a mixture of these, and thickening agents, such as starch, dextrin, British gum, albumin and the like, may be added.

The material after treatment may be washed and dried, or it may be treated with an acid, a tannin solution, or formaldehyde solution or other precipitating agent used in the viscose or like industries, and then washed and dried. Patterns may be produced by printing the material first with a reserve paste which contains albumins, gums, acids, alums, ammonium sulphate or other suitable materials, or the ester or alkali may be printed on the material, thickening agents being employed. Colors may be added to the reserve paste and to the ester. (British Patent No. 234,847.)

Bacterial Decomposition of Cotton During Damp Storage

The attack of the cotton fiber by micro-organisms is generally observed to commence at the ruptured end of the fiber and to proceed preferentially along the path of the central canal. Deterioration is estimated microscopically after swelling by the restricted xanthate reaction, the abnormal fibers being characterized by the absence of cuticular "beads" and general breakdown under the swelling action.

The general results of the storage tests showed that infection as a serious source of damage during damp storage is to be sought for and controlled in the unginned rather than in the ginned cotton. If the cotton has been subjected to damp and unfavorable conditions before ginning it is much less resistant to deterioration during subsequent normal storage than if it has been carefully dried after plucking and stored under dry conditions prior to ginning. Ventilation of the cotton containing seed is only advantageous in checking the development of micro-organisms when it is accompanied by conditions which are favorable to rapid "drying out" of the damp material; otherwise ventilation may stimualte the deterioration. Sun-drying is there-

fore advocated in addition to ventilation, particularly in preparing the fresh cotton prior to storage "in seed," and again prior to the baling of the ginned fiber. The practice of damping the cotton during the baling operation is condemned. (Jour. Textile Inst., 1925, pp. 185-196.)

RECENT PATENTS

Pyroxylin-Coated Fabric

(1,545,935; July 14, 1925)

Gilbert C. Bacon, Stamford, Conn., assignor to Atlas Powder Company, Wilmington, Del.

A fabric which has been dyed with that class of dyes known as the Indanthrene series, said fabric having a thin coating of pyroxylin material.

Hair and Fur Dye

(1,545,500; July 14, 1925)

Wolf Kritchevsky and Wm. K. Nelson, Chicago, Ill.

A hair dye consisting of a water solution of 1:2 naphthalenediamine-4-sulphonic acid, ferrous sulphate, borax and sodium acid sulphate.

Azo Dyestuff and Process of Making Same

(1,546,328; July 14, 1925)

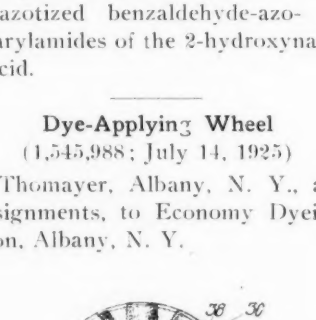
Karl Thiess, Sindlingen, near Hochst-on-the-Main, Germany, assignor to Farbwerke vorm. Meister Lucius & Bruning, Hochst-on-the-Main, Germany.

Process of producing azo dyestuffs, consisting in coupling diazotized benzaldehyde-azo- -naphthylamines with arylamides of the 2-hydroxynaphthalene-3-carboxylic acid.

Dye-Applying Wheel

(1,545,988; July 14, 1925)

George T. Thomayer, Albany, N. Y., assignor, by mesne assignments, to Economy Dyeing Machine Corporation, Albany, N. Y.



A dye applying wheel which comprises, a wheel having its peripheral edges each provided with a very slight radial flange and pockets at intervals in the surface between said flanges, and bodies of liquor absorptive material in said pockets.

Treating Textile Materials

(1,545,812; July 14, 1925)

Thomas Dow Ainslie, Metuchen, N. J., assignor to the Roessler & Hasslacher Chemical Company, New York, N. Y.

The method of treating goods packed in a kier or vat which consists in forcing under positive pressure treating liquor in a plurality of streams from within the kier toward the wall of the kier so as to distend the material within the kier toward the wall of the kier, and simultaneously flowing streams of the treating liquor vertically through the kier.

Black Vat Dyestuff

(1,546,859; July 21, 1925)

Paul Nawiasky and Emil Krauch, Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin- und Soda-Fabrik, Ludwigshafen-on-the-Rhine, Germany.

As a new article of manufacture, a vat coloring matter of the dibenzanthrone series, obtainable by treating nitrated dibenzanthrone with sulphur, being a black substance soluble in concentrated sulphuric acid with a reddish violet coloration and difficulty dissolving in boiling trichlorobenzene from reddish violet to blue and with a cherry-red flourescence, and when vatted, giving a blue solution, from which cotton is dyed from gray to black shades, after exposure to the air.

Process of Producing Cellulose Acetate

(1,546,619; July 21, 1925)

Virgil B. Sease, Newark, N. J., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

The process of making cellulose acetate which comprises first incorporating in cellulose fiber acetic acid, acetic anhydride and a small per cent of water based on the weight of the cellulose, at least substantial parts of the total amounts of acetic acid and acetic anhydride required for complete acetylation being thus incorporated, then subjecting the impregnated cellulose to the action of a bath containing an acetylating catalyst and any acetic acid and acetic anhydride necessary, in addition to that present in the cellulose, to produce the desired acetylation, adding water and a mineral acid to the resulting cellulose acetate solution, maintaining the temperature of the mixture at from about 40 to 65 deg. Cent. until a desired solubility of the cellulose acetate has developed, and then precipitating and washing the resulting cellulose acetate.

Process of Dyeing Cellulose Acetates

(1,546,969; July 21, 1925)

Rene Clavel, Basel, Switzerland.

Process for dyeing cellulose acetate with vat dyes, wherein the dyeing is effected in a hydrosulphite vat kept weakly alkaline by ammonia, caustic alkali being present only in sufficient quantity to form the leuco

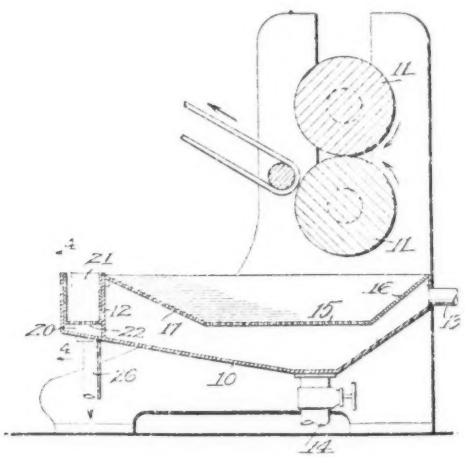
compound, said vat also containing protective colloid and at least one water soluble salt.

Catch Basin for Wool-Washing Machines

(1,546,578; July 21, 1925)

Frank L. Furbush, Westford, Mass., assignor to C. G. Sargent's Sons Corporation, Graniteville, Mass.

The combination with a washing machine having press rolls, of a catch basin located under the press



rolls thereof for receiving the drippings therefrom, a screen in the catch basin spaced above the bottom for separating the solid parts of the drippings from the liquid parts, a receptacle located all along one edge of the catch basin into which the solid parts of the dripping scan be introduced from the screen, and means at the end of said receptacle for delivering the solid parts at one point.

REMARKABLE WATERPROOFING PROCESS

A waterproofing process that is claimed to be as applicable to "the flimsiest textile or the substantial grand piano" has been perfected by a British inventor, E. Cook, according to a recent descriptive article in the Daily News Record.

The process is said to produce results on textiles which, if true, are decidedly interesting. A test is described in which a delicate fabric, ninon, was subjected to the process. To quote from the item referred to:

"Even through four thicknesses of ninon treated with the special process ordinary magazine print was still readable, yet the ninon, opened out into a single filmy piece and suspended at the four corners, held a pint of water like a bag, the water rolling about inside as quicksilver in the palm of the hand. After the operation the water fell clear into a sink, leaving the fabric as though it had never seen a drop of water.

"A further test was carried out with a piece of gauze, the meshes of which were large enough to permit the passage of the stem of a match and the gauze held the water equally well.

"A more severe test was the turning of a piece of silk fabric under a tap of running water to try and make it wet. At the end of a minute's drubbing the silk emerged clean, soft and dry, with the exception of a few tiny globules of water which adhered to the natural hairs of the cloth, but which were instantly shaken off. This experiment was to show that the process produced what is claimed to be a really 'proof' fabric and not merely a fabric with a waterproof skin superimposed, as in the case of a tent which remains waterproof until the inside of the fabric is touched.

"Normally, it was explained, this property is imparted to textile materials by a very simple and inexpensive process during its manufacture in the piece, and garments and other things are made up in exactly the same manner as though the cloth were untreated. Skilled workers, it is stated, cannot detect any change in the cloth."

TENTH INTERNATIONAL TEXTILE EXPOSITION

The dates for what will be the Tenth International Textile Exposition, in connection with the meeting of the National Association of Cotton Manufacturers, have been set for the week of April 12 to 17, 1926. The exposition will again be held in Mechanics Building in Boston together with the Power Show, in connection with the meeting of the New England Association of Commercial Engineers and under the auspices of that body.

Diagrams and application blanks have already been sent out to the trade and the response has been even better than that accorded the last previous exposition held in October, 1923, according to the announcement of General Manager Chester I. Campbell. It will be remembered that at the last show there was not a single vacant space left in Mechanics Building when the doors were opened on the first day of the exposition. Manager Campbell states that he has every reason to believe that the same condition will be met with in the forthcoming show, but ventures the prophecy that there will be an even greater demand for the space.

Another fact that fully warrants the assumption that the demand for space will be greater than before is that, among the many larger manufacturers of textile machinery who have already filed their applications, more than 75 per cent have asked for greater space than before. In some cases double the space has been requested.

In all, applications have been received for more than 250 spaces in Mechanics Building. This figure represents approximately 50 per cent of the total number of spaces contained in this building, and is a new high record for applications at this early stage of the exposition.

Applications for spaces should be mailed to General Manager, Chester I. Campbell, 329 Park Square Building, Boston, Mass. With almost every mail bringing in new blanks the question of early filing of applications is an important one to all who are desirous of exhibiting.

DYESTUFF TABLES

(Continued from page 675)

BRILLIANT WOOL BLUE B EXTRA

(Schultz No. 562)

COMPOSITION: Diphenylnaphthylmethane.

SPECIALLY SUITABLE FOR: Wool and cotton-wool unions.

USUAL METHOD OF DYEING: Unions, with Glauber salt; wool, with Glauber salt and sulphuric acid.

SHADE: A very clear pure shade of blue.

SHADE BY GASLIGHT: Considerably fuller and redder.

SOLUBILITY: Hot, good; precipitates when cold.

LEVEL: Dyes level.

FASTNESS TO:

Acid: Fast to acetic; greener with sulphuric.
Alkali: Sensitive; slowly destroyed by ammonia.
Chlorine: Slight.
Fulling: Fairly fast.
Light: Moderate, though better than Victoria Blue B.
Perspiration: Fast.
Rubbing: Crocks.
Steaming: Fast to moderate pressure.
Sulphur: Fast.
Washing: Fast when top-chromed.

SENSITIVE TO METALS, LIME: Slightly sensitive to iron; not sensitive to copper.

OTHER PROPERTIES: The fastness to rubbing is improved by continued boiling.

DYED BY OTHER METHODS: Top-chromed, somewhat duller and greener.

ON OTHER MATERIALS: Cotton-wool: Very well adapted, as in a neutral bath the cotton is left white and the wool is dyed a full shade; one-bath process produces two-color effects; goes on wool neutral well. Silk: Suitable; very clear shades fast to water. Gloria: The silk is somewhat lighter than the wool and bluer.

PRINTING: Printed on wool and silk, the color is distinguished by its great clearness of shade. It is well adapted for printing (pieces and slubbing) on wool, silk and gloria. On slubbing, the printed shade is not fast to hot water, nor are the printed shades on silk fast to water.

DISCHARGING: A 3 per cent dyeing gives a good discharge with zinc dust but not with tin. It is therefore suitable for color discharge with tin.

REMARKS: The product is exhausted in a sulphuric or oxalic acid bath without Glauber salt. It gives the brightest shades in a bath of tin chloride with acetic acid. Copper or iron salts in the bath turn the shade greener.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company.

L. T. Sherwood has resigned from the dye works staff of the E. I. du Pont de Nemours & Co., Deepwater Point, N. J., to take a position as glass technologist with the Pennsylvania Wire Glass Company. He will have charge of research and development work at their plant at Dunbar, Pa.

OFFICE MANAGER

Office manager wanted for Chicago office of dyestuff and chemical manufacturers. Person desired who has practical knowledge and experience in the same industry. Reply Box 309, American Dyestuff Reporter.

POSITION WANTED

Consulting textile chemist and dyer; experienced in analyzing and testing out dyestuffs, soaps, oils, softeners, gums and chemicals, for their best money value. Also experienced in testing yarns, cloths and silks. Dyeing experience: raw wool and cotton, worsted yarns and cotton, piece dyes of all kinds, union goods, mixed piece dyes made up of cotton, artificial and tram silk, shoddy, rags, stripping and bleaching, carbonizing and mercerizing. American, 45; best of references; familiar with all kinds of dyeing machines. Address Box 316, American Dyestuff Reporter.

TEXTILE CHEMIST

WANTED—By large textile mill: Experienced textile chemist for laboratory and plant work. Good knowledge of all classes of dyestuffs and their application to cotton, worsted and artificial silk, and ability to quickly match shades required. Initiative and willingness to assume responsibility desired. State age, training, experience and salary desired. Apply Box 317, American Dyestuff Reporter.

CHEMIST

Chemist wanted for textile plant; experienced with bleaching and finishing materials and their practical application; also capable of taking charge of testing and control work. Address Box 318, American Dyestuff Reporter.

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Please enter my subscription for the American Dyestuff Reporter for one year from date, for which you may bill me $5.00.

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New York 2-4-6 Cliff St. | Boston 40 Central St. | Philadelphia 583 Drexel Bldg.

JOHN D. LEWIS

IMPORTER AND EXPORTER

DYESTUFFS and CHEMICALS

—Manufacturer of—

TANNIC ACID, COMMERCIAL
TANNIC ACID, U. S. P. AD C. P.
TARTAR EMETIC
ANTIMONY SALTS
CRUDE AND HALF REFINED TARTAR
ANTIMONY LACTATE
ACETATE OF CHROME
FLUORIDE OF CHROME
ACETATE OF IRON
NITRATE OF IRON
GALLIC ACID
DYEWOOD EXTRACTS
TANNING EXTRACTS

Jobbers Of
CHEMICALS :: STARCHES :: GUMS

PROVIDENCE, R. I.
Office: 1209 Turks Head Building
Works: Mansfield, Mass.

Consult Us About Your Dyeing Problems

The services and advice of an expert chemist and a well equipped laboratory are at your disposal without cost, except when special research or experimentation is necessary, when the charges will be of a minimum nature.

American Dyestuff Reporter
90 William St. New York City

COLOUR INDEX

in the English Language

Edited by

F. M. ROWE, D.Sc., F.I.C.

assisted by

C. LEA, M. Sc. Tech.

and

A Large Revision Committee of Experts

Size **12½"** x **9½"** **371** Folios (**742** Pages)

Bound in Full Leather **$32.00** Bound in -Full Cloth **$28.00**

COLOUR USERS will find the "Alphabetical List" which sets out the various Makers of each Colour of the greatest use and assistance to them.

CONTENTS

SECTION A—Synthetic Organic Dyestuffs (291 folios).
SECTION B—Natural Organic Dyestuffs (10 folios).
SECTION C—Natural and Artificial Inorganic Colouring Matters (Mineral Pigments) (16 folios).
SECTION D—General Indices, Commercial Names, Patent Numbers, Intermediate Products, etc. (54 folios).

Commercial Names
Scientific Names
Components
Formula
Preparation
Discovery
Mode of Application
Literature
Description
Properties

of

Over 1300 Dyes

given, also a special column for purchaser's notes.

PUBLISHED AND ISSUED BY

The Society of Dyers and Colourists

PEARL ASSURANCE BUILDINGS, BRADFORD, YORKS., ENGLAND

For further particulars required apply THE SECRETARY

Over a Span of 51 Years

TO the unerring progress of Chemical control, the major productive powers of the Industrial World owe their full development.

Our contribution to this dynamic force spans a period of over a half century.

With justifiable pride, we therefore invite participation in a Chemical Service touching upon practically every phase of Industrial application—striking the highest average of successful attainment.

For Textile Manufacturers

BICHROMATES CAUSTIC POTASH
BETA NAPHTHOL PRUSSIATES
POTATO FLOUR DEXTRINE
FORMIC ACID STARCHES
PARANITRANILINE

Sizings • Softeners • Finishes
Dyestuffs and Colors

SULPHONATED OILS TURKEY RED OIL
CHROME CHLORIDE

A·KLIPSTEIN & CO.

644-52 Greenwich St.
NEW YORK CITY

Branches:
Boston Philadelphia Chicago Providence, R. I. Charlotte, N. C.

Represented in Canada by
A. KLIPSTEIN & CO., Ltd.
12 St. Peter St., Montreal

TEXTILES PAPER LEATHER

AMERICAN DYESTUFF REPORTER

SAMPLE SWATCH QUARTERLY

OCTOBER 19, 1925

GEIGY

SUPPLYING A MOST URGENT NEED

With the introduction of Cellulose Acetate Silk, the dyestuff manufacturers were confronted with a fibre which offered little or no affinity for the available dyestuffs. Attempts to meet the condition brought out a class of colors, the original shade of which was either yellow or orange, and, depending upon the developer used, produced a final shade of orange, red, maroon, navy blue or black.

At best this was a lengthy and laborious process, which required much handling and a consequent snarling of the yarns, making difficult winding and spooling. Moreover, successive and alike results were never assured.

The GEIGY chemists have forsaken the beaten path and have introduced a complete range of shades of *Direct Dyeing*

SETACYL DIRECT COLORS (Powder)

requiring no aftertreatment whatsoever and possessing the following outstanding characteristics:

(1) They are powdered in form, assuring uniformity of delivery and result (heretofore a gamble).
(2) They dye cellulose acetate silks in much the same manner as direct colors dye cotton, leaving all other fibres white or only slightly stained.
(3) They enable the production, in one bath, of multi-colored or "shot-effects," so essential in this market of novelties.
(4) They are fast to cross-dyeing, making possible the use of colored silk effects in men's wear.
(5) They possess *good fastness to light.*

GEIGY repeats the offer to illustrate on your own material the multi-colored effects possible with SETACYL DIRECT COLORS.

Samples immediately sent upon request.

Selling Agents for
J. R. GEIGY S. A.
Basle, Switzerland

BRANCHES:
Boston, Providence, Cincinnati, Philadelphia, Toronto, Portland, Oreg., Columbus, Ga.

GEIGY COMPANY Inc.
89-91 BARCLAY STREET
NEW YORK, N. Y.

In Great Britain:
THE GEIGY COLOUR CO., LTD
35-37 Dickinson Street
Manchester

Branch Works at Clayton

Established 1764

Manufacturers of dyestuffs since 1859

Rayon Yarn Treatments

TWO products of Klipstein origin which reduce yarn breakage, thus eliminating waste of time and material—also increasing the range of adaptability:

AKCO Rayon Size

For sizing Rayon warps in skein or on slasher. A perfect binding and strengthening agent for Rayon. Reduces breakage during weaving and increases winding efficiency.

AKCO Rayon Lubricant

A treated Olive Oil for processing Rayon before knitting. Lubricates the fibre, eliminates static electricity, increases production and eliminates waste. Readily removed in the washer prior to dyeing and finishing. Does not decompose and exhaust oil from extractor—can be returned to supply tank for reuse.

Working samples sent on request

AKCO TRADE MARK

A·KLIPSTEIN & CO.

644-52 Greenwich St.
NEW YORK CITY

Branches:
Boston Philadelphia Chicago

Represented in Canada by
A. KLIPSTEIN & CO., Ltd.
114 St. Peter St., Montreal

Branches:
Providence, R. I. Charlotte, N. C.

Eradicate Your Dyehouse Troubles

In every dyehouse certain shades or materials are the cause of many difficulties. For several years the following specialties have solved many troubles and their popularity is attested to by continual repeat orders:

HOSIERY—ALPINE RED 3B—A neutral dyeing, slow exhausting, level dyeing red for shading the silk.

UNION SILK GREY—A pleasing shade of gray, coloring cotton, viscose and silk the same shade.

AMANIL FAST BLACK L—As a base for grays and for shading, this product has all the advantages of its prototype and in addition dyes a solid shade on cotton and silk.

WORSTED—CHROMAVEN YELLOW L S W—The greenest type of this level dyeing color, competitiveiy priced against the ordinary brands Leaves silk clean.

CHROMAVEN BRILLIANT ORANGE 2R—The most level dyeing top chrome orange on the market.

DRESS GOODS—AMACID FAST PINK B CONC.—An extremely level dyeing product widely used as a component of tan and mode shades.

SILK—AMACID AZO YELLOW G CONC.—The most economical product on the market today.

LEATHER—NAPHTOL BLUE 3R CONC.—The American Aniline standard is the standard for AMERICA.

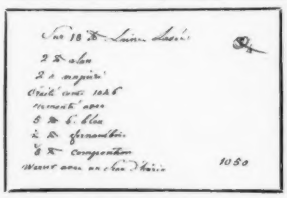
American Aniline Products, Inc.

45 EAST 17th STREET, NEW YORK, N. Y.

Offices: Boston, Mass.
Philadelphia, Pa.
Chicago, Ill.

Works: Lock Haven, Pa.
Nyack, N. Y.

Recipe from the Ancient French Dye Recipe Book

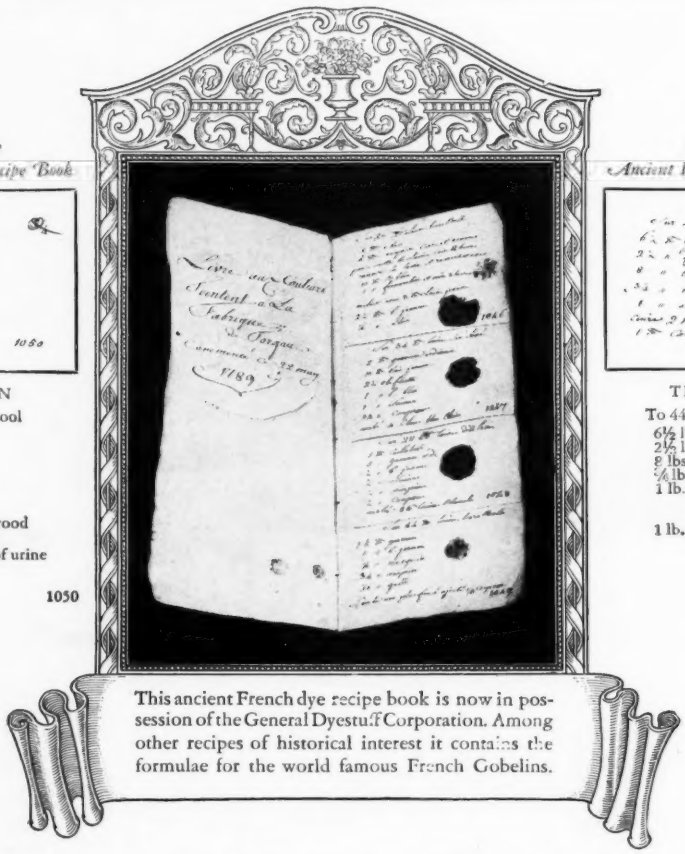


TRANSLATION

To 18 lbs. washed wool
2 lbs. alum
2 lbs. vinegar
treated as 1046

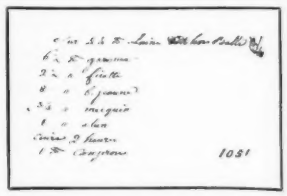
Topped with
5 lbs. Blue wood
½ lb. Pernambuco wood
⅛ lb. composition
soften with one pail of urine

1050



This ancient French dye recipe book is now in possession of the General Dyestuff Corporation. Among other recipes of historical interest it contains the formulae for the world famous French Gobelins.

Recipe from the Ancient French Dye Recipe Book



TRANSLATION

To 44 lbs. Wool out of bale
6½ lbs. crapp
2½ lbs. ficette
8 lbs. yellow wood
¼ lb. "Muquin"
1 lb. alum

Boil 2 hours

1 lb. Copperas

1051

No. 1 of a series of advertisements based on the dye recipes that established the supremacy of French textiles in the XVIIIth Century

WASHINGTON was inaugurated President when this collection of dyeing recipes was used for the production of fast colors in France. Now, after 136 years, these hand-penned formulae possess a deep historical and scientific interest. They graphically display the tremendous advance made by the dyestuff industry since 1789. Users of dyestuffs now have at their disposal many colors of far better fastness and easier method of application. The highest requirements of industry are today met by the types offered by us, and include the products of

GRASSELLI DYESTUFF CORPORATION

Plants: Rensselaer, N. Y. Grasselli, N. J.

and

FARBWERKE, VORMALS MEISTER, LUCIUS & BRÜNING

LEOPOLD CASSELLA & CO., G. m. b. H.

and other European manufacturers

GENERAL DYESTUFF CORPORATION

Successor to Dyestuff Department *of* H. A. METZ & CO., *Inc.*

122 Hudson Street

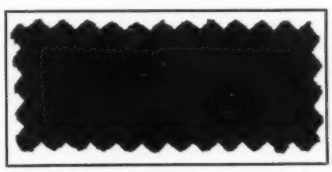
New York

128 Oliver St., Boston, Mass.
132 Chestnut St., Philadelphia, Pa.
301½ W. Trade St., Charlotte, N. C
316 Turk's Head Bldg., Providence, R. I
449 N. La Salle St., Chicago, Ill.
20 Natoma St., San Francisco, Cal.

NATIONAL DYES

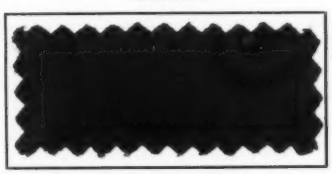
Fall Colorings For Men's Wear

NAVY BLUE



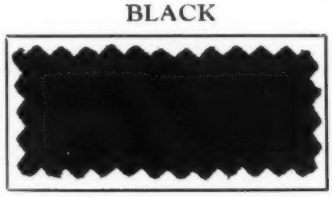
5% National Superchrome Blue B Extra
After-Chrome Process

GRAY



0.95% National Alizarol Gray DG
0.05% National Superchrome Garnet Y
After-Chrome Process

BLACK



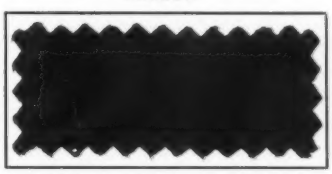
6% National Superchrome Black BN Extra
After-Chrome Process

Herewith are presented a series of Fall colorings adapted to men's suitings. The selections are made from the National line of After-Chrome and Ortho-Chrome dyes, and when applied by either of these processes yield dyeings possessing the degree of fastness demanded for such fabrics.

NAVY BLUE

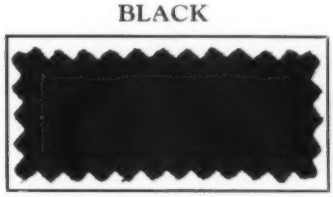
4% National Fast Wool Cyanone R
Ortho-Chrome Process

GRAY



0.95% National Alizarol Gray DG
0.05% National Superchrome Garnet Y
Ortho-Chrome Process

BLACK



6% National Alizarol Black 3 G
Ortho-Chrome Process

National Aniline & Chemical Company, Inc.

40 Rector Street, New York, N. Y.

Boston	Philadelphia	San Francisco
Providence	Charlotte	Toronto
Hartford	Chicago	Montreal

NATIONAL DYES

National Aniline & Chemical Company, Inc.

40 Rector Street, New York, N. Y.

Boston	Philadelphia	San Francisco
Providence	Charlotte	Toronto
Hartford	Chicago	Montreal

NEW YORK COLOR & CHEMICAL CO.

Manufacturers of ANILINE COLORS

Fast Dyes—

Mordant Colors for Men's Wear, etc., Fast to Extreme Requirements.

Fast Acid Colors for Ladies' Dress Goods, etc., Fast to Light and Level Dyeing.

Light Fast Colors for Cotton, Rayon and Silk, for Dress and Upholstery Material, etc.

Main Office and Works - - - BELLEVILLE, NEW JERSEY

Logwood

LOGWOOD is still the most lasting, beautiful and economical dye for most textiles.

It dyes uniformly, levels perfectly and penetrates excellently. It is successfully used in the finishing process for covering burrs—specks and other vegetable matter.

The rich, brilliant black of Logwood not only holds its color under the light of morning and afternoon, but also under artificial light at night.

QUEEN ELIZABETH'S INK

When Queen Elizabeth signed Parliament's act ordering all Logwood found in the kingdom to be burned, she unknowingly used ink made of the very thing she was condemning. The lasting quality of Logwood is evident in the legibility of the old documents which have come down to us.

The American Dyewood Company manufactures Logwood in extract, crystals and hematine paste. Write for particulars and prices.

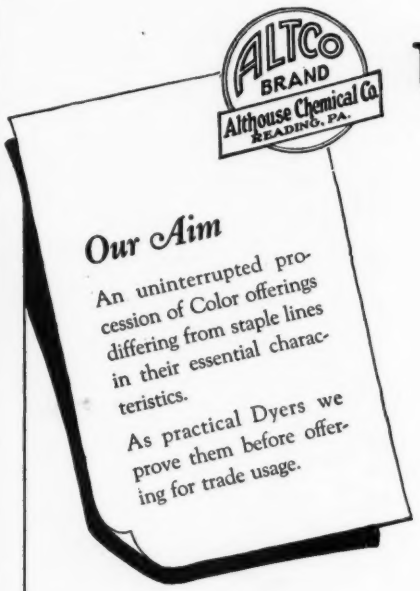
AMERICAN DYEWOOD COMPANY

PRODUCTION COST LOWEST

AMERICAN DYEWOOD COMPANY

NEW YORK · BOSTON · PHILADELPHIA · MONTREAL, P.Q.

Works at CHESTER, PA.


ALTCo
BRAND
Althouse Chemical Co.
READING, PA.
Our Aim
An uninterrupted procession of Color offerings differing from staple lines in their essential characteristics.
As practical Dyers we prove them before offering for trade usage.

Benzanol Art Black

AN Althouse Product—for the treatment of Artificial Silk and Mercerized combinations.

A dulling effect for medium and dark shades on Unions, retaining, by reason of a reddish cast, a blooming quality not apparent in ordinary mixtures.

Our products have practical application in our own organization prior to placement on the market.

A Sample Sent on Request

Althouse Chemical Company
READING, PA.

Made in America

USE "CAMEL" DYES

—for fastness

KROMEKO VIOLET 2 RLN
ANTHRACENE ACID BROWN RD
AUTOCHROME FAST GREEN LC

fast to light and fulling

Dye Monochrome, Afterchrome, or Chrome-bottom

WRITE FOR SAMPLES AND PRICES

Manufactured by

JOHN CAMPBELL & COMPANY

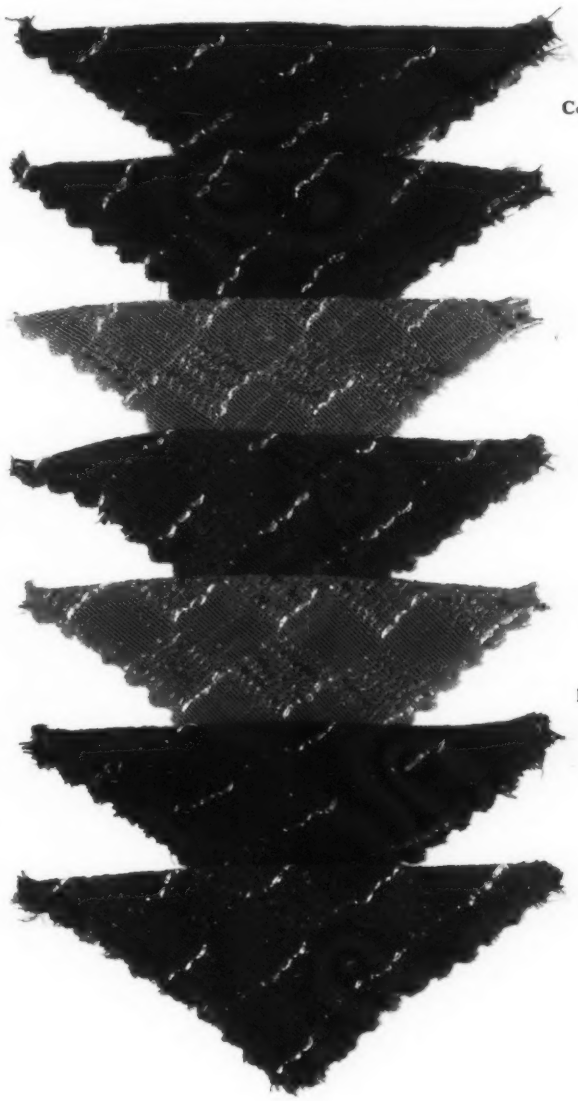
75 Hudson Street — *American Dyestuff Manufacturers* — New York, N. Y.

BRANCHES AND WAREHOUSES
BOSTON CHICAGO PROVIDENCE CHARLOTTE PHILADELPHIA

"STANDARDS EVERYWHERE"

QUALITY NOIL PRODUCTS

WHICH LEAVE CELANESE WHITE



1%
Cotton Brilliant Blue RCW

0.75%
Direct Green BCW

0.75%
Direct Brown RCW

0.25%
Cotton Black 3GCW

1.5%
Direct Fast Scarlet SCW

1.5%
Direct Brown MCW

0.75%
Direct Violet NCW

Noil Chemical & Color Works, Inc.

140-156 West 108th Street New York City

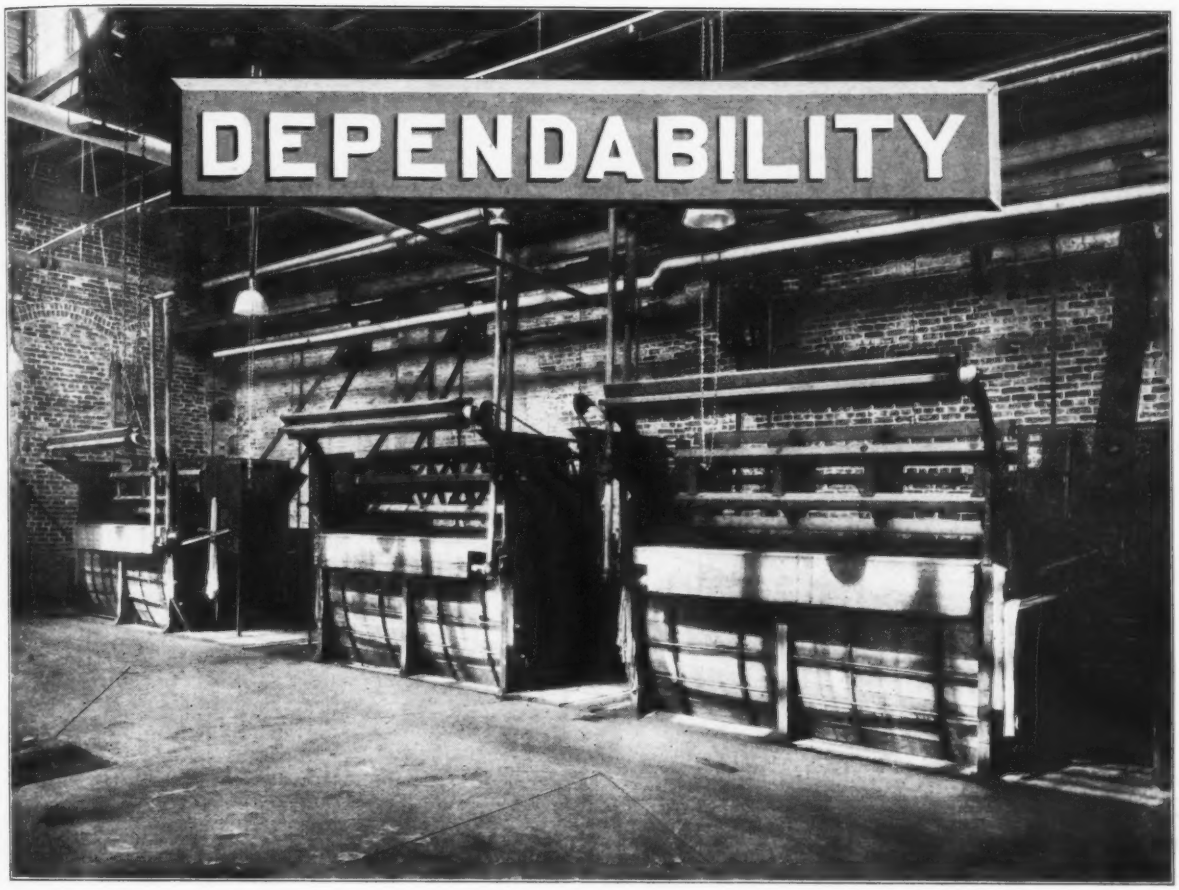
WE manufacture a line of purified direct colors which will dye cotton, rayon and cotton-wool unions to any desired self shade and at the same time leave Celanese effects undyed.

The samples on the reverse of this page illustrate but a few of these products and are typical of the entire line.

Stocks are carried by reliable distributors in all textile centres. Your inquiries will receive prompt attention.

Noil Chemical & Color Works, Inc.

140-156 West 108th Street New York City



Piece Dyeing—

The equipment illustrated above is one part of the dyeing section of a mill whose wet finishing machinery is 100% HUNTER. This specialization was not determined on a price basis, but on the life value and performance that HUNTER dependability assures.

Bulletins Nos. 53 and 53A which thoroughly describe HUNTER Piece Dye Kettles should be read by every boss finisher and mill executive. Both bulletins will be sent free on request.

Built by

HUNTER

JAMES HUNTER MACHINE CO. Hunter NORTH ADAMS, MASS.

It's Dependable

FOUNDED 1847

Speedy Replacement of Parts

When time costs money—when machinery is "laid up" for one cause or another—that's when you thank your lucky stars you bought a Klauder-Weldon, for in our Pattern Storage we have the pattern of any part you need in a hurry.

KLAUDER-WELDON

Dyeing · Bleaching · Scouring

MACHINES

Write, phone or wire your request and a replacement part is made quickly and accurately in our own foundry from the same combination of metals as was used originally. It will be on its way to you in a jiffy.

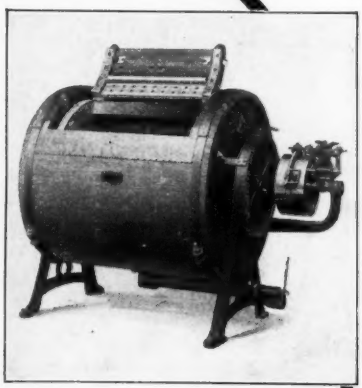
Illustrated literature on request.

Special Construction When Required

KLAUDER-WELDON DYEING MACHINE CO.

Originators · Pioneers · Leaders

BETHAYRES · PENNSYLVANIA



American Rotary Hosiery Dyeing Machines

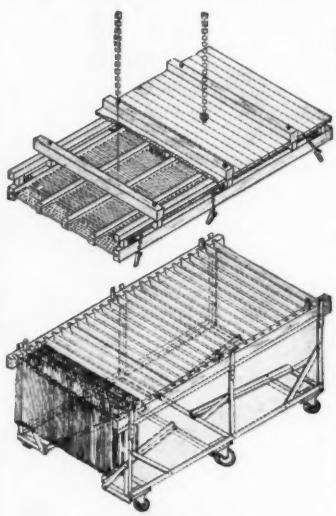
Under certain operating conditions, and for some special processes this Globe type wooden Rotary Dyeing Machine is especially suitable for hosiery dye houses. You'll find the full facts in Folio No. 714. Write for a copy—today.

The American Laundry Machinery Company

Specialty Department B

Norwood Station Cincinnati, Ohio

The Canadian Laundry Machinery Co., Ltd.
47-93 Sterling Road,
Toronto, Ont., Canada



Dyehouse Trucks

These are used with our split yarn rack or solid yarn rack machines.

With this type of truck those handling the yarn sticks do not have to step over bottom frames. The frames are open at the bottom, which facilitates placing the yarn sticks on, or lifting them off the trucks.

Patented

With these trucks, the yarn can be delivered to any part of the dyehouse or to adjoining rooms.

Patentees and Sole Manufacturers

Hussong Dyeing Machine Co.

GROVEVILLE, N. J.

SOCIETY OF CHEMICAL INDUSTRY IN BASLE.

Shades fast to light

produced with

NEOLAN BLUE G G AND NEOLAN GREEN B

in combination with

KITON FAST COLORS.

CIBA COMPANY

INCORPORATED,

NEW YORK, N. Y.

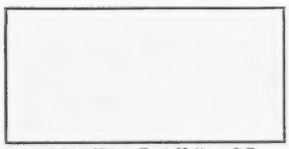
MADE IN SWITZERLAND

CIBA COMPANY INC.,

Shades fast to

produced wi

NEOLAN BLUE GG AND NEOLAN GREEN B IN C



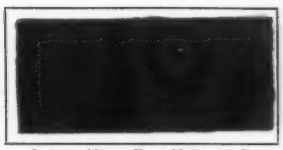
2% Kiton Fast Yellow 3G.

2% Kiton Fast Orange G.

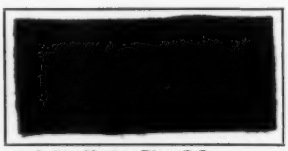
3% Kiton Fast Red R.

2 % Kiton Fast Red 4 B L,
0·5% Kiton Fast Red R.

0·3 % Kiton Fast Yellow 3 G,
0.13% Neolan Blue G G,
0·16% Kiton Fast Red R.

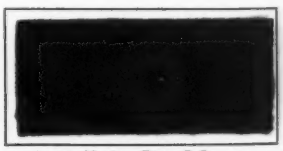


0·1 % Kiton Fast Yellow 3 G,
0·3 % Neolan Blue G G,
0·12% Kiton Fast Red R.



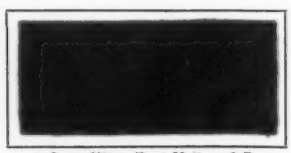
0·5% Neolan Blue G G,
2·5% Neolan Green B,
1 % Kiton Fast Yellow 3 G.

1·5 % Kiton Fast Yellow 3 G,
0·2 % Neolan Blue G G,
0·42% Kiton Fast Red R.

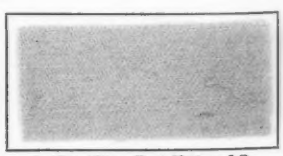


1 % Neolan Blue G G,
0·1% Kiton Fast Yellow 3 G.

0·2% Neolan Blue G G,
0·2% Kiton Fast Red 4 B L.



1·3 % Kiton Fast Yellow 3 G,
0·3 % Kiton Fast Orange G,
0·34% Neolan Green B.



0·15% Kiton Fast Yellow 3 G,
0·25% Kiton Fast Orange G,
0·01% Neolan Blue G G.

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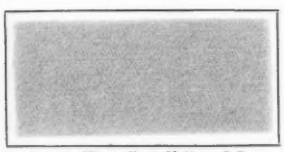
produced with

B IN COMBINATION WITH KITON FAST COLORS.

2% Kiton Fast Red 4 B L.

2% Neolan Green B.

2% Neolan Blue G G.



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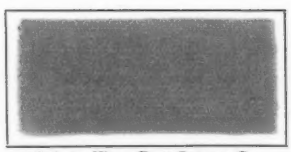
0·3 % Kiton Fast Orange G,
0·03% Neolan Green B.

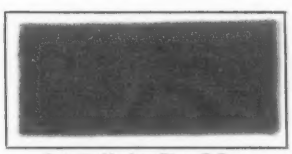


0·9 % Kiton Fast Orange G,
0·35% Kiton Fast Red R.

0·56% Neolan Blue G G,
0·65% Kiton Fast Yellow 3 G,
0·5 % Kiton Fast Red R.

0·65% Neolan Blue G G,
0.45% Kiton Fast Yellow 3 G,
0·42% Kiton Fast Red R.

0·17% Kiton Fast Yellow 3 G,
0·05% Kiton Fast Orange G,
0·3 % Neolan Blue G G,
0·15% Neolan Green B.



0·1 % Neolan Blue G G,
0·04% Kiton Fast Red R.

2 % Kiton Fast Yellow 3 G,
1 % Kiton Fast Red 4 B L,
0·15% Neolan Blue G G.

1 % Neolan Blue G G,
0·27% Kiton Fast Red 4 B L.

1 % Kiton Fast Red 4 B L,
0·1% Neolan Blue G G,
0·1% Neolan Green B.

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Neolan Yellow GR	Neolan Red 3B	Neolan Green B	Neolan Blue B
Neolan Yellow R	Neolan Pink G	Neolan Blue GG	Neolan Navy Blue R
Neolan Red R	Neolan Violet R	Neolan Blue G	Neolan Black 2G

If desired, certain of the Kiton Fast Colors may be used in combination with the Neolan Colors—as illustrated on the accompanying pattern sheet.

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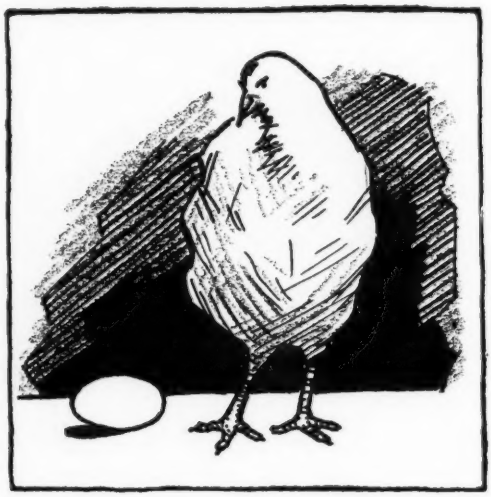

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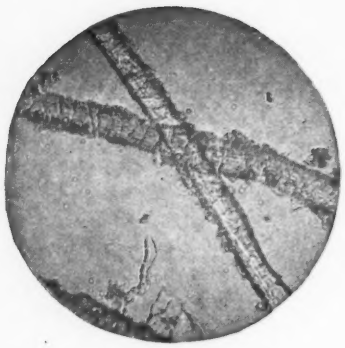

Whenever soap is used in a natural water supply, lime soap curds will deposit on textile fibres as in the left-hand photomicrograph. Note how clean, softened water made the right-hand wool fibres. See text below.

Water is Your Biggest Raw Material

You Profit by Studying it

YOU would not think of buying raw materials for your mill without a careful examination—but has it ever occurred to you that water is also raw material that should be studied with a view to quality and freedom from impurities?

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Examine closely these two photomicrographs. The one on the right shows wool fibres that were scoured in conditioned water from which all the undesirable mineral impurities had been removed. Note how clean these fibres are. They will produce the finest quality of finished yarns and cloth. Then look at the other picture which shows fibres heavily coated with lime soap deposits.

This wool was scoured in a natural water supply, and the small amount of lime that was present made the manufactured products very inferior in quality.

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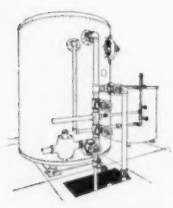

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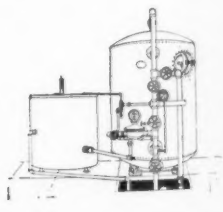

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NEW YORK, OCTOBER 19, 1925

Colored Goods and the Laundry

Modern Laundry Practice—Colored Cotton Shirts—Knit Underwear—Woolens—Silks—Overalls—Hosiery —Colored Curtain—Rugs—Fugitives—Summary

By GEORGE H. JOHNSON*

THE modern laundry is far from being the decrepit, run-down, unbusinesslike establishment that many are prone to believe. There was a time when a few thousand dollars would start a man in the laundry business and keep him going, especially if he were able to obtain liberal terms of credit from laundry machinery and supply houses. To-day, however, it is another story. Monel-metal washers, zeolite water softeners, motor-driven extractors, drying tumblers, flat-work ironers, presses, shirt units, delivery and engine-room equipment, and all that goes with the operation of an up-to-date laundry, costs money. The result is that there is gradually being attracted to the business of cleaning clothes a class of men that speaks well for the future of the industry. The modern laundryowner is a strong association man, local, State and national. He is deeply interested in textiles and the chemistry of laundering as it is taught not only by his research department but by some of the efficient supply houses of the day. He refers his engineering and accounting problems to his association. He studies advertising and devises ways and means of convincing the housewife (he would call her the home manager) that the laundering of clothes is not a woman's job.

It has been stated that the modern laundryowner is deeply interested in textiles. He also is deeply interested in the colors that are used to dye and print textiles. There was a time when the color problem was not a serious one, this being in the days when practically all work consisted only of shirts and collars, possibly hotel work, and towels and aprons from linen supply houses. The modern laundry, however, is founded on the family bundle that comes to the plant containing articles of all descriptions, many of them colored. Work that comes to the average laundry is classified somewhat as follows:

(a) White shirts and collars.
(b) Colored shirts.
(c) Family flat-work.
(d) Colored rough dry.
(e) Commercial flat-work (hotels, restaurants, etc.).
(f) Woolens.
(g) Silks (including rayon pieces).
(h) Knit underwear.
(i) Overalls.
(j) Curtains.
(k) Stockings.
(l) Fugitives (colors of poor fastness to washing).

*Director of Research, Laundryowners' National Association, and Senior Fellow, Mellon Institute of Industrial Research, University of Pittsburgh.

Colored Cotton Shirts

Colored shirts of two sorts are sent to the power laundry—first, light colors, such as stripes and checks; and, second, solid shades. As a rule, very little trouble is had with the first classification, since the diazotized and developed, sulphur and vat colors generally used are able to withstand soap and such builders as soda ash, modified soda, trisodium phosphate, etc. Yarns that are to be used for partly colored shirtings must be able to withstand soap and builder at 140 to 160 deg. Fahr. Fastness to bleaching is not necessary. Shirts are received badly soiled, as a rule, especially at the cuffs. This means that lukewarm washing will not cleanse the yarns thoroughly and that temperatures such as have been listed must therefore be used. The ordinary high titer laundry soaps possess their minimum surface tensions and exert their maximum emulsifying efficiencies between 140 and 160 deg. Fahr., depending largely on the soap base and the titer. Most tallow laundry soaps possess a titer between 40 and 42 deg. Cent.

Solid shades in shirtings are not laundered above 120 deg. Fahr. Although good quality of solid shade shirtings are dyed with colors that will easily withstand soap and alkali at such a temperature, many of the cheaper grades frequently are dyed with ordinary direct colors of questionable fastness. Many powder blues, tans and pearls may hardly be laundered at all, even at lukewarm temperatures.

The following is the standard washing formula recommended by the Laundryowners' National Association for colored cotton shirts and similar pieces:

(100 to 125 pound load in a 36 x 54 inch washwheel.)

First Bath—Warm water (95 to 100 deg. Fahr.); 5 inches inside the wheel. Add a mixture of 88 per cent neutral soap and soda ash to make a good suds. Run ten minutes.

Second Bath—Warm water (120 deg. Fahr.); 5 inches. Soap and soda as before. Run ten minutes.

Third Bath—Repeat.

Fourth Bath—Repeat.

[It will require much less soap and builder to produce a running suds in the third and fourth baths.]

Fifth Bath—Warm rinse (120 deg. Fahr.); 10 inches of water. Run five minutes.

Sixth Bath—Repeat.

Seventh Bath—Repeat.

Eighth Bath—Repeat.

Ninth Bath—Cold rinse; 8 inches of water. Add ½ pint acetic acid or 3 ounces of sodium acid fluoride (harmless to vegetable fibers). Run four to five minutes.

[Note—For ordinary colored work, three parts of soap and one of soda ash (by weight), or its equivalent, are used. Badly soiled work may require two parts of soap and one of soda ash and, with the exception of solid shade, a temperature of 140 to 160 deg. Fahr.]

The laundryowner is required to return shirts and similar pieces clean. When washing at 120 deg. Fahr. will not remove the dirt, he is forced to use higher temperatures. The following rules have been impressed on all members of the association:

1. Neither bleach nor oxalic acid is to be used when washing colored goods.

2. Striped and similar shirtings are not to be laundered above 160 deg. Fahr.

3. Solid shades and other light-colored garments are not to be laundered above 120 deg. Fahr.

It has been pointed out repeatedly that the fastness of colored clothes to washing never can be judged simply by looking at a garment. Dyers and chemists who use cotton dyestuffs that will withstand soap and builder at 160 deg. Fahr. need not worry about the way in which colored goods will be handled in the modern laundry. While it is perfectly true that laundries, particularly such as have never seen the advantages to be derived from association work, may use higher temperatures than 160 deg. Fahr. for light-colored work, or may, in extreme instances, launder such pieces with white work, the fact remains that such a practice is not countenanced for an instant in the properly conducted washroom. Dyers need not be concerned with the use of boiling temperatures for colored work, at least as far as the laundry is concerned. Such practice is far more likely to occur when clothes are laundered in the home.

Knit Underwear

Knit cotton underwear is handled by every laundry, most of it in the bleached state, but a great deal that has been colored. While the use of Javel water in suitable quantities is to be recommended for white cotton underwear, chiefly for sanitary reasons, its use is not recommended for underwear that has been dyed Egyptian or wool color with ordinary direct cotton colors. Random-dyed garments are not bleached in the modern plant. Dyed cotton underwear is not laundered above 120 deg. Fahr., soap and soda ash or a similar builder being used. To avoid shrinkage, many laundryowners handle knit underwear as they do woolens, but use one or two more suds, depending on how badly soiled the pieces may be. Woolen pieces and heavy fleece-lined cotton underwear are laundred at 100 deg. Fahr. with a very high suds and water-level to diminish the pounding action in the wheel. Dyestuffs should be used to color cotton underwear that are able to withstand the action of soap and alkali at 120 deg. Fahr.

Woolens

Woolens that may be sent to the laundry include blankets, knit underwear, and occasionally sweaters and similar pieces. Regardless of the types of dyestuff that may have been used, colored woolens are never laundered above 100 deg. Fahr.—first, in order to help control shrinkage; and, second, to keep the wool fibers soft and pliable. Soap alone is used except when the water is hard or the pieces badly soiled. Excessive alkali is avoided, however. Very little trouble is experienced with bleeding colors in the case of woolens, for the simple reason that the shades laundered generally have been dyed with chrome or acid colors. The more fugitive basic and phthalic anhydrides are seldom encountered.

(Small load in a 36 x 54 inch or in a pony washer.)

First Bath—Eight inches of water in the wheel at 100 deg. Fahr. Run the wheel and add neutral soap to make a very high suds. Add a small load and run ten minutes.

Second Bath—Stop Wheel. Flood load with water at 100 deg. Fahr. Run one minute.

Third Bath—Repeat.

Fourth Bath—Repeat.

Fifth Bath—Repeat and add a small amount of acetic acid to set and brighten colors. Dump and pull the load.

[Note—A second suds will be required if the load is badly soiled.]

Silks

Colored silks require the greatest of care, in many cases because the shades found dare not exceptionally

fast. There is no doubt that many of the colors used to dye silk are chosen for their clarity of shade and beauty rather than fastness. Naturally, this is not always the case; but it has proved to be true in so many instances, that careful handling is essential. The properties of certain classes of dyestuffs vary with the fiber to which they are applied. Direct cotton colors, as a class, possess only poor to medium fastness to washing on cotton, whereas on wool or silk faster shades are obtained. Diazotized and developed colors are quite satisfactory on silk. Acid colors on silk, however, are not nearly as fast to washing as they are on wool. When basic and phthalic anhydride dyestuffs are used, shades of poor washing qualities are obtained.

The modern laundry, when handling colored silks, never uses temperatures about 90 to 100 deg. Fahr., and takes care that only a good grade of neutral soap containing no free alkali used. The washman avoids the use of alkaline builders in any form, and frequently washes the pieces by hand. Rayon pieces are handled in the same way.

Overalls

Since overalls and similar garments receive very harsh wear, they are frequently sent to the laundry badly soiled and covered with grease. For these reasons, it is absolutely essential that dyestuffs be used that are fast to washing. Frequently this is not the case. There is no excuse for using anything more fugitive than sulphur colors or Indigo on overall material to-day. Although fastness to light is not remarkable with certain sulphur colors, especially yellows and oranges, fastness to washing is good.

For many years laundries, like housewives, were forced to use soap and alkali at a boil in order to clean greasy overalls properly. There was no other known method for cleaning them. During the past year, however, a new formula has been worked out that not only cleans overalls thoroughly but also permits of the use of lower temperatures during washing.

First Bath—Warm rinse at 100 deg. Fahr.

Second Bath—Five inches of water at 140 to 160 deg. Fahr. To a 100-pound load add 5 pounds of soda ash and 8 pounds of common salt (NaCl). Run fifteen minutes.

Third Bath—Repeat.

Fourth Bath, Etc.—Rinse until water runs clear.

The above formula is highly successful. Some laundryowners add a ten-minute suds with soap, but this is not necessary as a rule. Manufacturers of overalls would do well to issue the above Laundryowners' National Association formula in the form of printed washing directions with every garment sold. The use of lower temperatures means that the colors stand up better and that far less trouble is experienced with shrinkage.

Hosiery

The laundryowner is well aware of the fact that it sometimes is impossible to dye hosiery fast shades when so many types of fibers are used. Very little trouble is experienced with black cotton hose, which, for the most part, are dyed with sulphur black. Brown and blue on

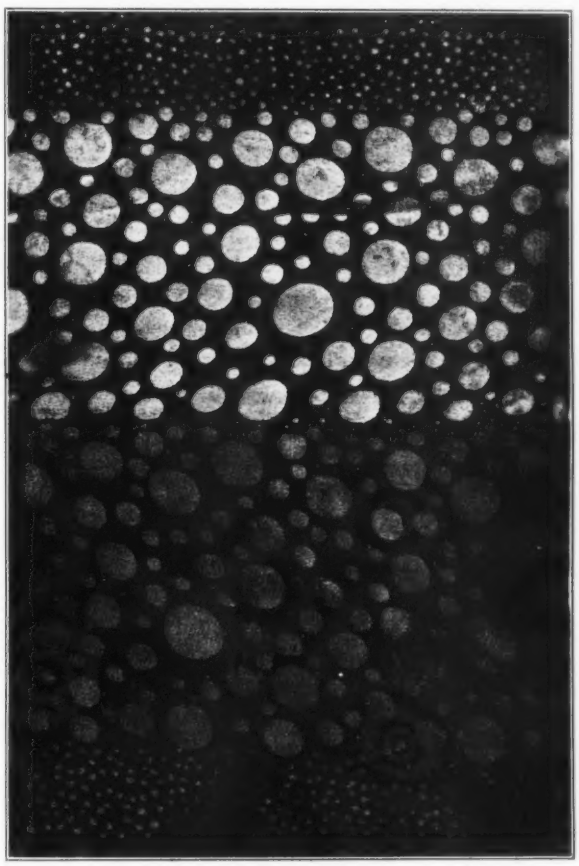


Fig. 1—*Poorly Dyed Silk*

At the top is shown a portion of a silk dress as it was sent to the laundry. At the bottom is shown the way in which the material reacted to washing at 100 deg. Fahr. with soap alone. When tested in the laboratory, the blue color bled into the white design even when dipped in water at 80 deg. Fahr. In other words, it was impossible to launder the above material without ruining the dress. Extremely fugitive dyestuffs had been used.

cotton are likely to be much more fugitive because of being dyed chiefly with ordinary direct cotton colors. Frequently cotton-silk mixed hose give trouble because of being dyed with directs. Superior fastness, of course, is obtained when diazotized and developed colors are used. Little trouble is experienced with the properly dyed worsted stocking. Whenever mixed fibers are used, the laundryowner has discovered that fastness depends entirely on the dyestuffs used. Some may withstand laundering at 160 deg. Fahr., while others may scarcely be handled successfully at 110 deg. Fahr. For this reason, tempera-

tures of from 90 to 100 deg. Fahr. are used during laundering. Stockings are turned inside out before being laundered.

FIG. 2—*Improperly Dyed Silk Hose*

The above pair of stockings consist of silk legs and cotton toes, heels and welts. When pinned together and washed at 100 deg. Fahr. with soap alone, the black cotton sections in one stocking turned brown. The silk retained its black color. This indicates that the socks were dyed in two different baths, one of which was defective.

First Bath—Lukewarm water showing 3 inches on the inside cylinder of washwheel. Add stock soap solution sufficient to form a very high suds. Run twenty-five minutes.

Second Bath—Lukewarm water to half cover the goods. Run five minutes.

Third Bath—Repeat.

Fourth Bath—Repeat.

From this it will be seen that the ordinary washing process for hosiery is a mild one. The hosiery dyer should be able to meet such conditions without a great deal of difficulty.

COLORED CURTAINS

Colored curtains (chiefly ecru) are sent to the laundry not only soiled, but also badly faded as a result of exposure to the sun. Because of the flimsy texture of curtains, they are always laundered in nets similar to those that are used for hosiery dyeing. As a matter of fact, a goodly proportion of power laundries are washing the bulk of their ordinary work in nets, partly for the sake of convenience in handling and partly in order to preserve the public's clothes as far as possible. In the washwheel, the nets and not the clothes receive the wear and tear of laundering. It does not take one long to decide which is the easier on fabrics, washing in nets in the laundry or scrubbing on a washboard in the home. Colored curtains are washed according to the following formula:

First Bath—Water at 100 deg. Fahr. Use a good quality neutral soap to produce a suds. Run five minutes.

Second Bath—100 deg. Fahr. Add soap as before and run ten minutes.

Third Bath—Repeat if curtains are badly soiled.

Fourth Bath—Rinse in water at 100 deg. Fahr. for five minutes.

Fifth Bath—Repeat.

Sixth Bath—Repeat.

Seventh Bath—Cold rinse for five minutes.

Badly faded ecru curtains are often tinted in the plant, sometimes with a suitable mixture of direct cotton colors and sometimes with a dilute solution of potassium permanganate. The latter oxidizes to form manganese dioxide, which, in dilute enough concentration, simply colors the curtains a fine shade of ecru that is quite fast to sunlight and ordinary washing. It may be readily removed from the material by stripping with a warm dilute solution of sodium bisulfite.

RUGS

During recent years laundries have expanded and grown to such an extent that they have entered previously undreamed-of fields of work. First came the shirt and collar bundle, then the family bundle, and now, in addition to these, laundries have taken up special services such as cleaning awnings, curtains, and rugs, dry-cleaning, and even umbrella and shoe repairing. The cleanings of rugs by commercial laundries has come to be a fact. The public is gradually coming to realize that it is just as advisable to clean rugs as it is to send cotton and linen pieces to the laundry. And so the carpet yarn dyer will soon discover that he must produce not only shades that are fast to light and dust, but also shades that are fast to washing and dry-cleaning.

There are two approved methods for cleaning rugs, first, dry-cleaning and second, shampooing. The former makes use of organic solvents, the latter of neutral soap and water. In either case, the first operation is

dusting, which generally is accomplished by using a vacuum, beater, or dust wheel. The latter is so constructed that it lifts the carpets and drops them repeatedly without injury to backing or sizing. The strap and suction duster is a beater. The rug passes continuously through the machine and is beaten by a number of straps carried on a revolving trap. The dust is carried off by suction. After the carpet is dusted, it may be dry-cleaned or shampooed.

Shampooing consists of placing the rug on the floor and spreading a cold soap paste on one end of the fabric. This paste is prepared by boiling eight to ten pounds of neutral soap in a few gallons of water, making up to 50 gallons, and allowing to cool. Once the cold soap jelly is on the rug, it is shampooed quickly with a rotary brush, more soap being added as needed. Shampooing is quick and thorough, averaging but three to four mintes on a 9 x 12 foot rug. Systems vary, but in many plants the excess soap is scraped off with a blunt-edged steel scraper, the operator working with the nap rather than against it. A vacuum treatment follows that removes as much of the soapy suds as is possible without rinsing. The rug is then thoroughly rinsed with cold water. After the soap is removed, the colors are set and brightened by sprinkling a dilute solution of acetic acid on the rug. Drying and sizing follow.

Fugitives

Cotton fugitives have given so much trouble to laundries that as a matter of self-preservation many laundryowners have been forced to adopt cold-water washing methods or else make numerous separations. No one can deny that although tub-fast or fast-dyed shades are to be had, many cotton garments are colored with extremely fugitive dyestuffs. If washed with other pieces, they bleed into and discolor them or, if washed repeatedly, lose their intensity and depth of shade. From time to time a number of methods have been published by dealers of domestic laundry supplies, that are supposed to render fugitive colors fast. As a matter of fact, they are practically valueless. Cotton fugitives are simply dyed with cheap direct cotton colors and are applied to the fiber in conjunction with alkali and common salt. It is because of their extreme solubility that direct colors bleed, the salt that is used in dyeing simply assisting in exhausting the bath. However, when the salt and excess color are rinsed away, the direct cotton dyestuffs on the fiber assume their normal solubilities and bleed when laundered. It is impossible to render fugitive cotton colors permanently fast to laundering.

When handling fugitives, the washman sorts the various colors and launders each classification at 90 to 100 deg. Fahr. with soap and as little alkali as possible. Sometimes it is found that, regardless of the care taken, the color will strip and bleed into other pieces. Because of this fact, the cold-water recently has come into use. While it is doubtful if cold-water washing cleans badly soiled pieces as effectively as warm-water methods do, there is no denying that there is far less tendency for colors to bleed at the lower temperatures. Cold-water soaps are of two types: First, low titer soaps commonly made from an oleic acid or similar base, and second, potassium soaps. The latter are more soluble in water than the ordinary sodium soaps and hence rinse better in cold water. When cold-water soaps are used the laundryowner avoids the numerous separations that are otherwise necessary.

Conclusion

In this brief manner have been described the laundering methods that are used when handling colored goods in the well-conducted commercial laundry. Dyers would do well to study these formulas for they will clear up a great deal of the misconception that may have existed in their minds as to the manner in which dyed or printed goods are treated after having been sold to the public. No attempt is being made to give the laundry industry, as a whole, a clean bill. There are some laundries conducted by men who know

(*Concluded on page* 709)

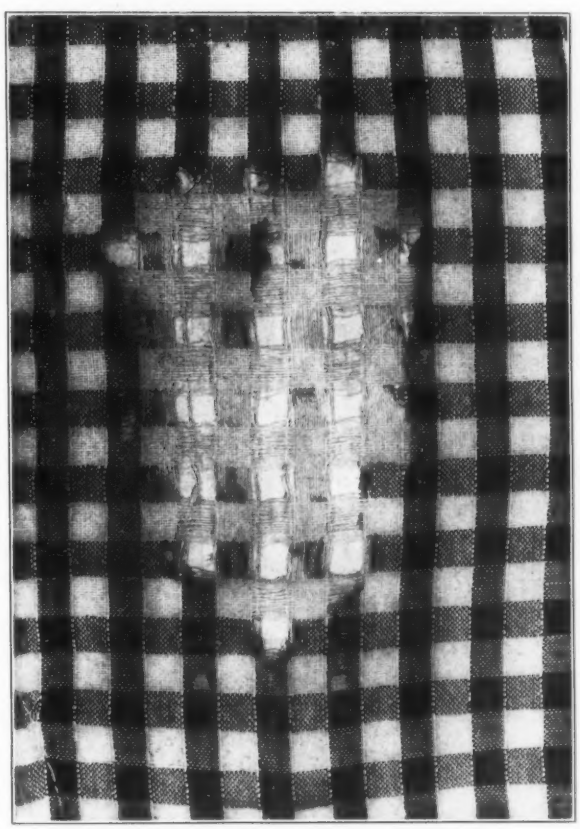


Fig. 3—*Sulphur Black*

Troubles with sulphur black, such as illustrated here, are quite annoying to the industry. The laundry patron almost always insists that the so-called "acids" of the laundry are responsible. It is practically impossible for a layman to conceive of such a defect being due to the dyestuff used.

The Reduction Products of Azo Dyes

Part II

(*Continued from page* 650)

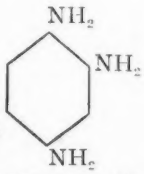
By WALTER C. HOMES

Color Laboratory, Bureau of Chemistry

[EDITOR'S NOTE.—*The most practical and effective method for the identification of azo dyes consists in the isolation and identification of the products which they yield on reduction. This method finds less application than it might or should, partly because some of these products have never been isolated and investigated, and partly because much of the data which has been obtained in regard to such reduction products is greatly scattered and very difficult to locate.*

Mr. Holmes has made a search for all the available information on such reduction products, and this series contains a digest of his results with a systematic listing of the reduction products of the azo dyes published in the Colour Index, together with the available data on such properties and reactions as would be of service in their identification.]

No. 4.—1, 2, 4-TRIAMINOBENZENE



$C_6H_9N_3$; Mol. Wt. 123.13; (C, 58.5%; H, 7.4%; N, 34.1%).

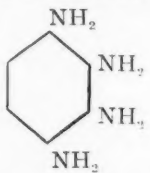
Derived from: C. I. Nos. 20, 167, 220, 273, 331, 339, 352, 352A, 396, 537-541, 546, 559, 560, 571, 573 (580), 581, 588, 600, 617, 619.

Leaflets ($CHCl_3$). Mpt. below 100°, bpt. about 340°. Readily sol. in H_2O and alc, in $CHCl_3$ with some difficulty and in ether with considerable difficulty. Turns brown quickly in air. Aqueous sols. turned wine-red by $FeCl_3$, red brown by acid nitrite sol.

Hydrochloride: ($C_6H_9N_3.2HCl$), needles; easily sol. in H_2O, with difficulty in alc and in HCl. *Sulfate:* difficulty sol. in cold H_2O.

Triacetyl deriv., mpt. 235°, gives an anhydro deriv. which melts at 248°.

No. 5.—1, 2, 3, 4-TETRAMINOBENZENE



$C_6H_{10}N_4$; Mol. Wt. 138.14; (C. 52.1%; H. 7.3%; N, 40.6%).

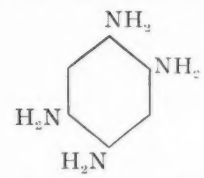
Derived from: C. I. Nos. 221, 334, 368, 369, 440, 596, 597, 606-609, 612 and 618 by complete reduction.

The free base is rapidly oxidized by air. Sols. of salts turned brown by oxidizing agents without formation of characteristic imide deriv. (distinction from sym. tetraminobenzene). Also distinguished from sym. isomer by its slighter basicity, giving only dibasic salt with H_2SO_4.

Acetyl deriv., long silky glittering needles, mpt. 260° (probably a triacetylethenyl deriv.).

Picrate, yellow leaflets, unstable. *Sulfate* ($C_6H_{10}N_4.H_2SO_4$), nearly colorless leaflets, scarcely sol. in cold H_2O but readily sol. in HCl. Gives fine golden-yellow needles (alc.), mpt. 218° with excess diacetyl (heat).

No. 6.—1, 2, 4, 5-TETRAMINOBENZENE



$C_6H_{10}N_4$; Mol. Wt. 138.14; (C, 52.1%; H, 7.3%; N, 40.6%).

Derived from: C. I. Nos. 230-233, 535 and 536.

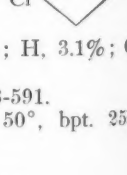
The free base is quickly oxidized by air (giving tetraminodiphenazine). Aqueous sols. of salts turn brown in air in presence of acids and blue-violet (imide deriv.) in their absence.

Acetyl deriv., long needles (HOAc), mpt. 285° (probably a triacetylethenyl deriv.), difficulty sol. in alc.

Hydrochloride: ($C_{10}H_{10}N_4.4HCl$), small prisms, very sol. in H_2O, difficultly sol. in HCl. *Sulfates: tetrabasic* salt with large excess H_2SO_4; tribasic salt, leaflets, mod. sol.; dibasic salt, needles, sol. with difficulty.

With phenanthrenequinone; orange-yellow needles, nearly insol. in glac. HOAc, dissolves in H_2SO_4 with green-blue color, on dilution giving a violet then red color and finally a pptte. of the orange-yellow base.

No. 7.—2, 5-DICHLORANILINE



$C_6H_5Cl_2N$; Mol. Wt. 162; (C, 44.5%; H, 3.1%; Cl, 43.8%; N, 8.6%).

Derived from: C. I. Nos. 242 and 588-591.

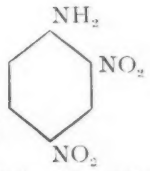
Long, thick needles (ligroin), mpt. 50°, bpt. 251° (246° at 744 mm.).

Monoacetyl deriv., mpt. 132°.

Diacetyl deriv., plates (alc.), mpt. 91-2°.

Hydrochloride, colorless needles, mpt. 191-2°; *sulfate*, glittering scales, mpt. 196-7°.

Diazotized and coupled with *β-naphthol;* fine orange-red needles (HOAc), mpt. 184°.



No. 8.—2, 4-DINITRANILINE

$C_6H_5N_3O_4$; Mol. Wt. 183.09; (C, 39.3%; H, 2.8%; N, 23%; O, 35%).

Derived from: C. I. No. 50 by partial reduction.

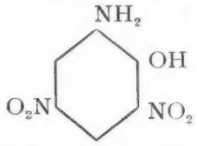
Yellow monocl. cryst. with bluish sheen. Mpt. 187-8°. D = 1.615. Insol. in cold, and only sl. sol. in hot H_2O. 95% alc. at 21° dissolves .75%.

Monoacetyl deriv., long needles, mpt. 120°, sl. sol. in H_2O and very sol. in ether and hot alc.

Diacetyl deriv., large, flat, dense, clear yellow cryst. mpt. 112-3°.

Diazotized and coupled with: *β-naphthol*, small red needles (HOAc), mpt. 302°, deep violet sol. in H_2SO_4, yellow-red pptte. on dil. *Naphthol AS*, small bronze needles (HOAc), mpt. 305°, wine-red sol. in H_2SO_4, orange-red pptte. on dil.

No. 9.—4, 6-DINITRO-2-AMIDOPHENOL (Picramic Acid)



$C_6H_5N_3O_5$; Mol. Wt. 199.09; (C, 36.2%; H, 2.5%; N, 21.1%; O, 40.2%).

Derived from: C. I. Nos. 101-108, 245 and 272 by partial reduction.

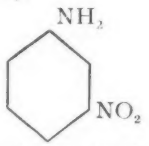
Red needles or monocl. prisms ($CHCl_3$), mpt. 168-9° Readily sol. in C_6H_6, HOAc and HCl, rather sol. in alc., but sol. with some difficulty in $CHCl_3$ and ether. .14% dissolve in H_2O at 22° (not much more in hot H_2O).

Hydrochloride: red brown needles, losing part of acid on standing in air and all acid at 80°; *acetate*, small prisms, mpt. 193°, sl. sol. in H_2O, more sol. in alc.

Alkali salts yield deep red sols, turned yellow-green by acids. *Na salt* (+ H_2O), dark red crusts, 2.06% of anhyd. salt sol. in H_2O at 15.5°; Cu salt, yellow-green, amorphous; *Zn salt* (+ H_2O), yellow miscrosc. needles, .017% of anhyd. salt sol. in H_2O at 23° (.0543% at 100°) (Monat. *8*, 391).

Gives picric acid with HNO_3.

Gives blood-red color in ammon. sol. treated with ferrotartrate reagent (Ann. des Fals. *9*, 231).



No. 10.—m-NITRANILINE

$C_6H_6N_2O_2$; Mol. Wt. 138.09; (C, 52.2%; H, 4.4%; N, 20.3%; O, 23.2%).

Derived from: C. I. Nos., 36-39 and 236 by partial reduction.

Long yellow needles or rhomb. cryst., mpt. 114°, bpt. 285°. Volatile with steam (distinction from p-nitraniline). D. 1.398 (18°). Burning sweet taste. Dissolves in 600 parts H_2O at 18° but is readily sol. in hot H_2O; m-xylene dissolves 1.74% at 15°; at 20° alc. dissolves 7.05%, ether 7.89%, C_6H_6 2.45%, meth. alc. 11.06%.

Acetyl deriv., white leaflets (alc.), mpt. about 154°; (*dibromacetyl deriv.*, yellow prisms, mpt. 143°).

Picrate, mpt. 147°; *m-nitrobenzoate*, long, yellow needles (ether), mpt. 88-9°; *2, 4, 6-trinitrobenzoate*, small plates (C_6H_6) or long needles (alc.), yellow, mpt. 139° (decomp.), only sp. sol. in hot H_2O; *2, 4, 6-tribrom-3-aminobenzoate*, minute canary-yellow prisms (C_6H_6) or lemon-yellow felted needles (H_2O), mpt. 143°; *benzene sulfonate*, mpt. 236°, H_2O at 15° dissolves 3.85%; *α-naphthalene sulfonate*, mpt. 261°, H_2O at 15° dissolves .15%; *β-naphthalene sulfonate*, mpt. 260°, H_2O at 15° dissolves .19%.

Additive comp. with sym. trinitrobenzene, yellow needles, mpt. 98° (cor.). Condens. prod. with 2, 4-dinitrobenzaldehyde, mpt. 138°, insol. in H_2O. Reduced to m-azoxyaniline by Zn dust in alk. sol. but gives m-phenylenediamine on complete reduction.

Diazotized and coupled with: *β-naphthol*, red prismatic needles with green lustre (HOAc), mpt. 194°, dissolves in H_2SO_4 with wine-red color, yellow-red pptte. on dil.; *Naphthol AS*, small, red needles (HOAc), mpt. 271°, red sol. in H_2SO_4 and red pptte. on dil.

No. 11.—p-NITRANILINE

$C_6H_6N_2O_2$; Mol. Wt. 138.09; (C, 52.2%; H, 4.4%; N, 20.3%; O, 23.2%).

Derived from: C. I. Nos. 40-50, 238, 243, 244, 246, 592-594 by partial reduction.

Long, yellow needles (monocl.) or prisms, mpt. 148°. D. 1.437 (14°). Almost tasteless and is not volatile with steam (distinction from m-nitraniline). Sol. in 45 parts boiling H_2O. At 20° .077 gm. dissolve in 100 cc. H_2O, 5.84 gm. in alc. and 6.1 gm. in ether. m-Xylene dissolves .28% at 15°. Very sol. in acetone.

Acetyl deriv., mpt. 215-6° (also reported as 207° and is possibly dimorphic); *diacetyl deriv.*, pale yellow flat plates, mpt. 128.5-9°; *trichloracetyl deriv.*, glittering prisms, mpt. 142°.

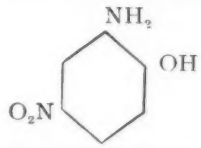
Picrate, mpt. 180-1°; *α-naphthalene sulfonate*, mpt. 241°; *β-naphthalene sulfonate*, mpt. 247°.

Gives no additive comp. with sym. trinitrobenzene (distinction from m-nitraniline). Condens. prod., with *benzaldehyde*, mpt. 167°; with *2, 4-dinitrobenzaldehyde*, mpt. 169.5°, insol. in H_2O.

Diazotized and coupled: with *β-naphthol*, red-brown needles (HOAc), mpt. 250°, violet-red sol. in H_2SO_4, red-brown pptte. on dil.; with *Naphthol AS*, red-brown leaflets with bronze lustre, mpt. 290°, red sol. in H_2SO_4, red pptte. on dil.

On reduction it gives p-phenylenediamine.

No. 12.—4-NITRO-2-AMINOPHENOL



$C_6H_6N_2O_3$; Mol. Wt. 154.09: (C, 46.7%; H, 3.9%; N, 18.2%; O, 31.2%).

Derived from: C. I. Nos. 98 and 99 by partial reduction.

(*Continued on page 705*)

American Eagle is the private chop of Hara. This silk is notorious for containing silk that gives an immense amount of trouble in the mill, especially in the throwing, due to a large number of fine and very fine.

Yacht is a fair chop. It is very liable to run off into Shinshiu. Should always be carefully tested for cohesion and strength.

Carnation is a double extra quality. It generally will run better for evenness and cleanness than "Cherry" or "Gunze," sold by the same firm. It is a good hosiery silk.

Kikokusha is an original chop and is a hard-natured silk, having a dense thread and generally running very even and high in strength.

The Kawano & Co. ticket is from a Crack Double Extra handled by Mitsui. It is an excellent chop, high in physical qualities and having a full rounded thread of high cohesion and high luster. Particularly good for hosiery.

Round Stork is the private chop of Morimura Arai. This silk is noted for its high physical qualities and the very large number of fine ends that it contains.

Rikuzen is a hard-natured silk and very slow in the boil-off, and generally high in cleanness defects.

The Classification of Raw Silk
Part IV—Conclusion

Chop Marks and Qualities of Raw Silk Which They Designate—The Weight Test and Boil-Off Test

By KARL R. MOORE

IN buying silk one will note that some lots of silk come through with the chop tickets of the original reeler on them, while others bear the chop marks of certain well-known importing firms. Those chops bearing the original tickets are generally from fairly large reeling establishments which have become favorably known in the market for certain classes of work. The output of some of the smaller filatures and some of the less favorably known reelers is bought up by the large importers, the silk is then examined by their inspectors and reclassified, and the chop mark of the importer replaces that of the original reeler. On the opposite page are some of the more common chop marks appearing in the New York market, with a brief description of their more outstanding general characteristics.

On account of lack of manufacturing space and high labor costs, much of the silk purchased in the New York market is sent out to commission throwsters to be made into thread. The throwster performs the operations of opening the bales, tying in bundles, soaking, and winding, and doubling. In order to have some check upon the character of the work performed by these various throwsters, it is necessary for the mill laboratory to make a conditioned weight test and a boil-off test upon the raw silk before sending to the throwster and to repeat these

Form T L 25

TESTING LABORATORY

REPORT

Lot No. 3008 Bale No. 19720/29 Date

Stock B#1 to X 13/15 Chop Three Irises Seller Mitsui

CERTIFICATE OF CONDITIONED WEIGHT

Mark and No.

19720
19725

Two samples of six skeins each are tested first and if difference is bigger than ½%, then use third sample.

	TEST NO. 1		TEST NO. 2		TEST NO. 3	
One bale Gross Weight Lbs. / Kilos						
Shirt Weight Kilos	62	2	62	2		
Shirt & rope / Paper & string						
Net weight Lbs. Kos.	61	1	61.	1		
Of 18 skeins taken for test, 12 were used.					Combined	
Original weight--Grams	879		865	7		
Absolute dry weight-"	777		766	5		
Add 11%						
" 2%						
Cond. weight						
Gain in Grams / Loss %						
Absolute weight of Bale figured on both tests	54	0	54	1		
Add 11%	5	9	5	9		
" 2%						
Cond. weight-Kilos	60	0	60	0		
Gain in Kilos / Loss %						

Boil-off Test

	RAW		THROWN	
	Grams	%	Grams	%
No. 1 One sample weighed			90.5	
Absolute weight before	132.7		84.2	
" " after	108.8		66	
Loss in Boil-off	23.9	18.0	18.2	21.6
No. 2 One sample weighed				
Absolute weight before	134.4			
" " after	110.5			
Loss in Boil-off	23.9	17.8		
Average loss		17.9		21.6

Oil added by throwster 3.70%

Resumé of whole lot

Sent to Duffy for 2thd 7 turns

Net invoice wt of 10 bales	1343-15
Conditioned wt plus 2%	1347-15
Net invoice wt sent Duffy	1340-3
Conditioned wt raw	1344-3
Boil-off raw 17.80%	240-8
Net fibre raw	1103-11
Returned by Duffy	1350-3
Conditioned wt thrown	1393-8
Boil-off thrown 21.60%	301
Net fibre thrown	1092-8

WASTE MADE BY THROWSTER ...11 lb 3 oz

upon the return of the thrown silk by the throwster. By doing this an accurate check is obtained upon the amount of oil added and the number of pounds of waste made. The method of carrying out these check tests with each lot is shown on test form TL 25.

(*The End.*)

The Parisian Textile Printing Company, recently organized at Paterson, N. J., with capital of $50,000, has purchased a plant and started operations. Joseph Homsy is president, and J. W. Riggenbach, treasurer, of the company.

The Chemical Foundations of the Artificial Silk Industry*

The Collodion Process—The Cuprammonium Process—Comparative Production Costs—The Viscose Process—Formation of Alkali Cellulose—Conversion Into Viscose—Wood Pulp in the Viscose Process

(*Svensk Pappers-Tidning, April* 15 *and* 30, 1925)

By PROF. EMIL HEUSER

Translated by Dr. Paul Barthelow

THE manufacture of artificial silk should be of peculiar interest in Sweden, though an actual artificial silk industry does not flourish here. But this interest is to be explained by the fact that wood pulp is the chief raw material for making artificial silk to-day; in fact, Sweden, where the manufacture of cellulose is one of the principal industries, has delivered, in particular, during the last two years, large quantities of its sulphite pulp to foreign artificial silk mills.

The term "artificial silk" is not happily chosen, because one immediately thinks of a substitute, of something of inferior value, of some material which is compared to natural silk. Hence, names for the new product have been sought, e. g., "cellulose silk," or "glanzstoff," that is, collodion silk. To-day, however, artificial silk can no longer be regarded as a substitute; it has become a textile product, with very definite properties and meaning, which can hold its place with natural fibers, such as cotton, wool and silk.

The use of fibrous cellulose for the manufacture of artificial silk depends on the fact that the raw material, first, and indeed directly, or during the process of pulping, is reduced into solution, and this solution is then converted into the form of a thread; whereas, the primary material in the first phase of the process, that is, during solution, is subjected to many variations, and, in the second phase, the conversion of the solution into thread form, we have always the same principle. This is effected by causing the viscid solution by means of pressure to flow out through an orifice of a fine nozzle and thence into a medium which takes up the solvent and renders the residual cellulose material stiff by coagulation.

This process corresponds in most respects to the methods which nature employs in the production of silk by the silkworm, which spins a fine thread consisting of albumin from its spinneret. This material hardens in the air. The difference between the manufacturer of artificial silk and the silkworm, therefore, consists only in the detail that the silkworm employs no solvent for the silk substance. This circumstance suggested to Chardonnet the invention whereby a solution of nitro-cellulose is spun into artificial threads. Though others before him had worked out this principle—the Swiss, Audemars, and the Englishman, Swan—to Chardonnet, however, must be given the greatest credit, since it was due to his tireless energy that the process was successfully put in practice. At the Paris Exposition of 1889 he showed the first samples of collodion silks.

The Collodion Process

In the collodion process cellulose in the form of cotton waste, or rather, cotton linters, are treated with nitric and sulphuric acids, and in this way converted into an ester of nitric acid; this is dissolved in a mixture of ether and alcohol, and the solution spun out of the nozzle. As a means of removing the solvent and of coagulating the thread hot air is used. This drives off the very volatile solvent which is subsequently recovered. If the threads are allowed to drop into water, salt solution or other media of a similar nature, the process is known as the

*Paper (abridged) read at the winter meeting of the Union of Swedish Paper and Pulp Engineers, Stockholm, February 28, 1925.

wet spin, but for the production of collodion silks to-day only the dry spin is used.

The original product for this process is therefore nitrocellulose, a definition, however, which is not correct, as it is a question here not of the nitration of cellulose, as, for example, in the case of benzol, toluol, and similar agents, in which nitro groups enter into the molecule, but rather of the formation of esters. In this, as in all similar reactions, cellulose is to be regarded as an aliphatic alcohol; by the action of nitro-hydrochloric acid the hydroxyl group is esterized, and we obtain compounds of this form:

$C_6H_9O_4$ (ONO_2) mononitrate of cellulose

or

$C_6H_7O_2$ $(ONO_2)_3$ trinitrate of cellulose.

We have our choice whether to convert into esters, one, two, or all three hydroxyls. For the manufacture of nitro silks we choose a nitrate with about 12 per cent of nitrogen, that is, a mixture of mono- and di-nitrate, which is also designated with the name collodion cotton. The solution in ether-alcohol is the universally known collodium. For cellulose preserves its fibrous character during and after esterification; we can therefore subject it to further manufacture with such machines as are operated in the pulp industry; thus we can wash and defibrate the nitrocellulose in the beater and remove the greater part of the acids which—if they remain in the fibers—decompose the compound and thus give rise to combustion and explosions. The removal of the acids, the so-called stabilization of the nitro cellulose, is therefore an operation of the greatest importance. To this also belongs the boiling out with water, whereby the by-products are removed, and similarly, drying, which must be effected with great care, for we have to deal with an inflammable, and in some circumstances a still explosive material. The nitrocellulose is now dissolved in the mixture of ether and alcohol, then filtered and conveyed to the spinning machine. After evaporation of the solvent the artificial threads consist of nitrocellulose, which have only lost their fibrous character, but which are still inflammable, consequently a very unsuitable material for clothing.

On this account the threads must be deprived of their inflammable property. This is accomplished by means of subsequent treatment with reducing agents, for example, sodium sulpho-hydrate. By this way the thread is reconverted into pure cellulose. The esterification was here only a means of rendering the cellulose soluble. The finished nitro silk, which is at this point nothing else but cellulose silk, is not more inflammable than paper. The fact must be especially noticed, because in some newspapers reports nitro silk is asserted to be a dangerous material.

The nitrocellulose process is costly, first, because of the conversion of cellulose into nitrate, but chiefly on account of the use of expensive solvents, ether and alcohol. It can be carried out economically only when it is possible to recover these solvents in the highest possible quantities. These difficulties have put the process into the background. Nevertheless it has been possible of late to bring to a high degree of efficiency the process of recovery, so that to-day nitro silk manufacture appears to be profitable. In Germany a mill is in operation in Schwetzingen, and in Belgium the famous old works at Tubize.

It is clear that in world competition that process must attain first place which reaches the object through simpler and cheaper processes. These are the cuprammonium and viscose processes. Theoretically and from a chemico-technological standpoint the former is simpler than the latter, but having regard to the chemicals used, as well as the spinning process, it is the dearer of the two.

The Cuprammonium Process

According to the cuprammonium process cellulose, mostly in the form of cotton linters, is dissolved in ammonium oxide. It is then only necessary to filter this solution, which has a certain degree of cellulose concentration and a certain viscid character of viscosity, and spin out of the nozzle. For this purpose air is not sufficient as a medium; we must cause the threads to run out into a solution which removes the solvent by means of decomposition. Formerly this was effected with about 50 per cent sulphuric acid. The salt of copper formed dissolved and the regenerated cellulose remained, of which the threads now consist. The cellulose, however, and with it the silk, was injured by this process of precipitation, for it was necessary to use rather strong acid for the decomposition. On this account the process of decomposition is divided into two phases: through the use of an alkali bath the threads are first coagulated. As they still contain copper an after-treatment follows in which the spun threads are freed from copper by means of dilute sulphuric acid and the threads converted into pure cellulose.

Much attention has been bestowed on the question as to how cellulose goes over into solution in cuprammonium oxide. It is in no sense a question of a simple solution, but rather cellulose, again as an aliphatic alcohol, becomes a compound of complex nature with oxide cuprammonium. This reagent is to be regarded as chemically cupratetramin hydroxide and so in a position to react with the cellulose alcohol, the spinning solution thus containing cupratetramin alcoholate of cellulose. The cuprammonium oxide process is an economic method only if the greatest possible recovery of the chemicals employed can be continually accomplished. Since this problem has been solved, 85 per cent of the ammonia and up to 95 per cent of the copper being recover, the economic conditions have been met. Nevertheless, this process is not widespread to-day, because the viscose process is cheaper.

Comparative Production Costs

If we compare the nitro silk with the cuprammonium silk, which is also known as "glanzstoff," from the economic standpoint, we find a considerable difference be-

tween the costs of production, otherwise both silks have advantages and disadvantages. Nitro silk generally shows more luster and is more easily dyed than "glanzstoff." On the other hand the latter has greater strength than nitro silk. These differences are naturally attributed to the process itself. It is clear that the treatment with such strong acids as nitric and sulphuric attacks the cellulose beyond the point of esterification, the conditions exist here for the formation of hydro, and, in particular, oxycellulose, which causes a diminution in the strength of the thread, though produces a better dyeing quality. The solution of cellulose in cuprammonium oxide is a much milder process, the cellulose is better protected, and, accordingly, the threads possess greater strength.

A special merit of the cuprammonium silk process is that the solution can be spun into very fine threads by the Streck spinning method. In spinning by this process the threads are stretched and drawn out; the threads thus obtained have the fineness of natural silk. The process originated with Thiele in 1901, and was technically perfected by Dr. Schreiner of the Bemberg Company in Barmen.

The Viscose Process

Now we come to the viscose process. This is proportionately far more widespread than the two others; to-day most artificial silk is made by this method, though from the chemical and technical standpoint it is the most complicated of all. It is based on the fact that cellulose is first converted into alkali cellulose, and this is then converted into cellulose xanthate by treatment with carbon bisulphide. It is supposed that the reaction is analogous to the well known, and simpler reaction between sodium and carbon bisulphide in the presence of alcohol, according to the following equation:

$$CS_2 + C_2H_5ONa = C\begin{matrix}/O.C_2H_5\\ =S\\ \backslash SNa\end{matrix}$$

Since we treat cellulose as an aliphatic alcohol, this takes the place of ethyl alcohol, so that the following reaction appears possible:

$$CS_2 + (C_6H_9O_4)x\ ONa = C\begin{matrix}/O.(C_6H_9O_4)x\\ =S\\ \backslash SNa\end{matrix}$$

This should be cellulose xanthate, which dissolves in soda lye to a viscid liquid, from which is derived the name "viscose." We perceive from the equation that we have here a chemical process of great interest; the reaction involves a whole series of problems, which, in spite of investigation, are not yet to be considered as solved.

In the first place, the formation of alkali cellulose, the primary material, is a problem, in so far as it is not yet established whether actually an alcoholate is formed by treatment of cellulose with 16 to 20 per cent soda lye, or whether it is only a question of addition of sodium to cellulose. The old dispute—since Mercer's time—whether chemical combination or adsorption takes place, is decided in favor of a chemical combination by the investigations of Vieweg, and the more recent researches of Karrer, as well as by those carried out by me and my co-workers. This compound has the composition $(C_6H_{10}O_5)_2$ (NaOH); that is, for two molecules of $C_6H_{10}O_5$ there is one molecule of NaOH. We can especially support the view that we are dealing with a chemical reaction by the fact that we obtain the corresponding compounds with other alkalies, for example, with potassium and lithium hydroxide. The hydroxides were taken from lyes of equal concentration in equimolecular quantities. The same thing is the case with caesium and rubidium hydroxides. But here we find the formulas: $(C_6H_{10}O_5)_3$, CsOH and $(C_6H_{10}O_5)_3$, RbOH, consequently we have here three molecules of cellulose and one molecule of hydroxide. This knowledge is perhaps fitted to afford a further glimpse into the problem of the constitution of cellulose. Further theoretical considerations would lead too far here; only this should be pointed out, that the individual $C_6H_{10}O_5$ molecules of cellulose must be considered to have a much greater stability than hitherto has been the case.

Formation of Alkali Cellulose

To return to alkali cellulose. In the formation of this not only chemical but physical phenomena take part. Above all, the process of swelling is of importance. This proceeds hand in hand with the chemical process. With a definite concentration of the different lyes we find a maximum; these maxima however are reached exactly at the point where the alkali cellulose combination occurs. For example, a lithium hydroxide shows a maximum lye with 9.5 per cent of LiOH; with caesium hydroxide we find it in a 40 per cent lye. These interesting and direct relations between swelling and chemical reaction are probably to be explained by applying the rule of the hydration of the ions. According to this law the ions charged with atoms of the smallest atomic volume (such as that of lithium) in aqueous solution are charged with a much greater number of water molecules than the ions with a large atomic volume (such as those of caesium).

If the alkali ion forms a union with the cellulose molecule, it introduces with it its aqueous layer, and at the same time breaks apart the cellulose molecule, whereby the phenomena of swelling appear. Accordingly it will be easily understood that the alkali ion which best causes the cellulose to swell is that which brings with it the most water. As a matter of fact, lithium hydroxide effects the best swelling, and caesium hydroxide the least. Sodium hydroxide, as a rule, stands in second place. Thus both processes—the chemical reaction and the swelling—go hand in hand if we dip cellulose in the form of cardboard in a 17 to 20 per cent lye. After a short time if the board is compressed to about a third of its

weight and if we disintegrate it then in a defibering machine, we obtain a crumbly pulp.

But the technical process is not yet finished. The alkali cellulose must stand a long time at a temperature of 20 to 25 deg. Cent., before it is ready for subsequent reaction, the action of carbon bisulphide. With the standing of the alkali cellulose, which is known as preripening, a change in the cellulose is completed. This is probably in the main of physical nature. For the chemical composition of the cellulose portion of the alkali compound is not altered. The physical change, however, consists in a depolymerization, a reduction in the size of the cellulose molecule. This is known by the circumstance that cellulose for the most part is soluble in soda lye. A certain degree of depolymerization is desirable, but it should not proceed too far, because otherwise the viscose would be deficient in thickness, would not be viscid enough and therefore not be capable of spinning. We may perceive from these conditions that ripening requires a very extensive supervision and control in the mill. The conversion of alkali cellulose into viscose occurs, as already mentioned, through the action of carbon bisulphide; an orange-red pulp is obtained which dissolved in soda lye yields viscose.

As regards the action of carbon bisulphide, we must for the moment follow the theory of Cross and Bevan, the inventors of the viscose process, according to which a cellulose xanthate arises. But here again, in spite of all research, which speaks for this view, a problem presents itself. That is to say, the process which follows the action of carbon bisulphide, and serves the purpose of rendering the viscose solution suitable for spinning, and gives it the proper viscosity, is known as ripening. This ripening takes place in practice only when the solution is allowed to stand at room temperature. The ripening process consists only in the circumstance that the xanthate spontaneously alters its composition, the proportion of sodium and carbon bisulphide diminishes, so that the percentage of cellulose increases. At the end of the process the xanthate has gone over into pure cellulose. We can, therefore, consider the ripening process as one in which the xanthate is precipitated from time to time from the viscose by treating the xanthate with dilute sulphuric acid; we then find that the xanthate with increasing ripening has become poorer in sulphur and sodium. It is necessary now to find out the point of ripening at which the xanthate is capable of being spun, that is, the point where the solution possesses the requisite viscosity for spinning. This is the case when the ratio of Na, S and cellulose in the xanthate is as 1:2:4, that is, corresponding to the formula:

$$/O.(C_6H_9O_4)_4(OH)_3$$
$$C = S$$
$$\backslash S\ Na$$

When this xanthate is reached, the viscose approaches the coagulation point. We can see how necessary a careful control is, in order always to be able to spin a uniform product.

The two components split off—CS_2 and soda lye—form by-reactions, consisting chiefly in the formation of Na_2CS_3, sodium trithionate, which on its part is again decomposed with the separation of carbon bisulphide. For the spinning of viscose, as in the cuprammonium method, a bath is necessary. This takes care of the precipitation of the threads coming from the nozzles. Formerly solutions of ammonium chloride, ammonium sulphate, etc., were used. With such precipitation by means of salts the thread still consists of xanthate; it is still soluble in water, and consequently a bath with sulphuric acid must follow, in order to render possible the complete conversion to cellulose; thus the cellulose thread becomes insoluble in water.

To-day dilute sulphuric acid is used to which salts are added, such as sodium sulphate and bisulphate. The patent of Dr. Max Muller has rendered possible the great and widespread use of the viscose process, in particular since we have learned that the addition of glucose acts very favorably. To the Glanzstoff Mill of the Elberfeld Company is due the credit of having introduced this bath into technique with ever-increasing advantage. The threads thus obtained still contain traces of sulphur; these are removed by treatment with sodium sulphate. A moderate bleach with hypochlorite solution and the usual washing and drying complete, as a general rule, the important operations of the after-treatment. In spite of the complicated process the costs of production of viscose silk are the lowest. Clearly, therefore, the viscose process occupies the first place among the three processes.

Wood Pulp in the Viscose Process

In addition to the use of cotton linters by the cuprammonium process the use of wood pulp by the viscose process must be regarded as an extremely important advance. In the European mills wood pulp has become the only raw material for viscose. The kind of pulp employed is sulphite; other pulps have not proved so serviceable; probably this lies less in the chemical composition—though pentosanes and hexosanes may act unfavorably—than in the physical constitution of the fibers. The deeper reasons for this fact, however, are still unknown. So far we are not in a position to form an absolutely correct judgment as to the value of a particular pulp—why one pulp is suitable and another not. The pulp under investigation can fulfill the ordinary conditions, afford satisfactory analytical data and yet it can be manufactured with poor results. It follows that we are unable to see deeply enough into the constitution of cellulose which apparently has properties the secret of which is still hidden.

The pulp, however, should have certain qualities; it should contain no degradation products of wood and no amounts of hydrocellulose nor oxycellulose. The copper number should be as small as possible. The number 2 may be regarded as the limit. Further, the pulp should

contain as small amounts of substances soluble in alkalies as possible. These are mostly described under the name "hemicellulose." To this group belong not merely the pentosanes and hexosanes; rather, the greater portion of the alkali soluble substances belong to the pulp itself. Supposing, for example, that 14 per cent of sulphite pulp dissolves in 17 per cent soda liquor, then in the best circustances half consists of pentosanes and hexosanes, while the other half is cellulose. With a copper number of 2 not much hydrocellulose or oxycellulose is present. The pulp itself has become soluble in alkalies and this solubility is due to a physical change, polymerization, a reduction in the size of the cellulose molecules. We can artificially increase this polymerization to such a point that all the cellulose, consequently the entire pulp, is soluble in alkali. This gives us occasion for the view that depolymerization in the manufacture of pulp chiefly occurs during the cooking process, giving us a certain degree of power to regulate the depolymerization.

Obviously the constitution of the wood is of great importance, and here, in spite of the investigations of Wahlberg, Sieber, Bergman and others, we are to some extent still groping in darkness. The rate of growth, the thickness or density of the wood substance, whether young or old trees, these and many other factors determine the physical constitution of the pulp; and these and the conditions of cooking, and, finally, those of bleaching determine the alpha-cellulose of the pulp. In this connection it is well known that the Norwegian pulp in general contains the highest proportion of alpha-cellulose, next the Swedish and then the German, but why the Norwegian gives the best numbers I cannot tell.

Dyeing Acetate Silk

Part XVI

(*Continued from page 658*)

Caledon Vat Dyes for Two-Color Effects on Acetate Silk-Viscose Unions—Printing Acetate Silk—Sizing for Acetate Silk—Experiments—General Methods of Size Preparation—Grading—Removal of Sizing—Finishing—Uses of Acetate Silk and Cellulose Acetate

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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THE Caledon vat dyes are recommended for use with the Celatene dyes on acetate silk-viscose or cotton unions. In this process the vat dye is applied to the cotton or viscose first in a dye bath prepared as in Methods Nos. 105A, 105B, 105C, 105D and 105E, according to the particular vat dye used. Table No. XII gives a list of the suitable dyes and shows which method to use with the particular vat dye selected. The vat dye bath for the viscose or cotton is set and the dyeing is carried out in exactly the same manner as in applying them to cotton, but using chemicals as in the method selected.

TABLE XII

Showing Dyes and Methods of Application for Caledon Vat Dyes on Acetate Silk-Cotton or Viscose Unions

Dye	Use Method No.
Caledon Red BN	105A or 105D
Caledon Red Violet 2RN	105A
Caledon Red Violet RN	105A or 105D
Caledon Brown R	105B or 105D
Caledon Yellow 3G	105B or 105D
Caledon Red FF	105B
Caledon Brillian Violet R	105B or 105D
Caledon Blue R, GC and RR	105C
Caledon Blue GCD or RC	105C or 105E
Caledon Yellow G	105C
Caledon Golden Orange G	105C
Caledon Dark Blue B	105C
Caledon Brown B	105C
Caledon Jade Green	105C
Caledon Green B	105C
Caledon Brilliant Purple RR	105C or 105E
Caledon Purple R	105C

Method No. 105A: *Caledon Vat Dyes on Acetate Silk-Viscose or Viscose or Cotton Unions.*—For each kilogram of fabric prepare a twenty to one dye bath with 125 c.c. of 20 per cent sodium hydroxide solution, 20 grams of hydrosulphite and 400 grams of Glauber salt. The vat is prepared at 30 to 40 deg. Cent. (86 to 104 deg. Fahr.) and the wet-out material dyed cold. In machine dyeing, the machine is filled with soft water, one-third of the caustic and hydrosulphite added, and the machine run a short time. The remainder of the hydrosulphite and caustic soda is then added, and finally the diluted dyestuff. After dyeing about fifteen minutes, the Glauber salt is added and the dyeing continued for about fifteen minutes more. After dyeing, the material is squeezed and oxidized for twenty minutes. It is rinsed free of caustic and soaped in a 1 per cent soap bath at 60 deg. Cent.

(140 deg. Fahr.) to clear the acetate silk, and is then rinsed free of alkali, adding a little acetic acid to the rinse water if necessary. This acid does not interfere in cross-dyeing the acetate silk with the Celatene dyes later. (See alternative Method No. 105D.)

Method No. 105B.—This method is similar to Method No. 105A, except that the following formula calls for more hydrosulphite and Glauber salt. Use a twenty to one dye bath containing 125 c.c. of 20 per cent sodium hydroxide, 100 grams of hydrosulphite and 800 grams of Glauber salt. The vat is prepared at 40 deg. Cent. (104 deg. Fahr.) and the material dyed cold. In the case of Caledon Red FF, the vat is prepared at 50 deg. Cent. (122 deg. Fahr.) instead of at 40 deg. Cent. The procedure otherwise is just the same as for Method No. 105A. (See alternative Method No. 105D.)

Method No. 105C.—For these dyes no Glauber salt is required and the twenty to one dye bath is prepared with 500 c.c. of 20 per cent sodium hydroxide and 50 grams of hydrosulphite. Vat and dye at 35 to 60 deg. Cent. (95 to 140 deg. Fahr.), except in the case of Caledon Blue RR, GC, GCD and RC, where 50 deg Cent. (122 deg. Fahr.) is used. The operations are identical with Method No. 105A. (See alternative Method No. 105E.)

Method No. 105D.—Those dyes marked 105D in Table No. XII may also be applied in a dye bath containing, for each 100 pounds of material to be dyed with 1 to 20 per cent of dye stuff, 50 to 80 gallons (all measures are English) of water, 3.5 to 4.5 pints of 53 deg. Tw. caustic soda solution, 1.5 to 3 pounds of hydrosulphite and 10 to 30 pounds of Glauber salt.

Method No. 105E.—Those dyes marked 105E in the table may be applied in a bath containing, for each 100 pounds of material, 50 to 80 gallons of water, 7 to 8 pints of 53 deg. Tw. caustic soda solution, and 1.5 to 2.5 pounds of hydrosulphite for a 1 to 10 per cent dyeing, or 2.5 to 4.5 pounds of hydrosulphite for a 10 to 20 per cent dyeing.

When the vat dyes are applied in deep shades, the acetate silk is not usually left entirely unstained. Neither is the viscose or cotton left entirely white when the Celatene dyes are applied in deep shades. For equal shades, the acetate silk is usually less stained than the cotton or viscose, but this depends somewhat upon the temperature, alkalinity and time in the vat dyeing. For this reason the best results are usually obtained with light to medium shades, especially if the proportions of cotton and acetate silk are nearly equal.

Printing Acetate Silk

Brief mention has been made in several places regarding the printing properties of the various dyes or classes of dyes on acetate silk. The statement has appeared in the literature that the printing of acetate silk is even simpler than the dyeing and a wide variety of processes are used. In applying the basic, special acid, mordant, vat and many other dyes which have an affinity for acetate silk, formulas similar to those used for the application of these dyes to cotton will usually serve without much change. Glucose is generally used as the thickening agent for acetate silk printing paste.

After printing the vat dyes, the prints are usually steamed for about five minutes at about 100 deg. Cent. (212 deg. Fahr.) with moist steam. Where the oxidation has not been complete, an after-treatment with dilute hypochlorite solution, as in Methods Nos. 10 and 11, but more dilute, may be given. They should then be washed and soaped at 80 deg. Cent. (176 deg. Fahr.). Many printing paste formulas for use on acetate silk contain caustic soda, and the prints are given the steaming as above. This, of course, causes a local saponification of the acetate silk fiber, which in most cases is not objectionable and allows a wider range of dyes to be used.

Frequently these alkaline pastes may be used upon cotton-acetate silk unions, printing both fibers at the one operation. Where the printed design is small, the local saponification is not sufficient to cause any appreciable loss in weight or alteration in appearance of the acetate silk. Direct, vat and sulphur dyes which have no affinity for the unsaponified acetate silk may thus be applied as print colors.

Dyes of the dispersal type, which are usually marketed in the form of pastes, are printed directly on acetate silk by thickening the pastes with glucose or the usual thickening agents. The addition of a little ammonium thiocyanate frequently aids the process. The prints are dried, aged for a short time and then washed well and soaped.

The Celatene dyes may be printed on acetate silk fabrics or knit goods without difficulty. The slight solubility of these sulphonated anthraquinone compounds, combined with their high affinity for acetate silk, renders them very applicable for use as printing colors. It is interesting to note that a French chemist recently stated (Jour. Soc. Dyers and Colourists, 41, 252; 1925) that if small crystals of α-aminoanthraquinone, which are plainly visible under the microscope, are precipitated on the acetate silk fiber, they are gradually dissolved by and into the fiber substance. He explained this by stating that the acetate silk is not of crystalline structure, but is in a colloidal condition.

In printing the Celatene dyes on acetate silk, the dye paste is simply thickened, as in the case of the dispersal type of dyes, with any suitable gum thickening. Gum tragacanth has been particularly recommended. These pastes are printed directly and the prints steamed for about five to seven minutes. The addition of about ½ pound of soluble oil to each 100 pounds of printing color enhances the shade.

The Celatene dyes are not discharged by the usual methods; and, in fact, most colors on acetate silk are very difficult to discharge, especially where the special acetate silk dyes are used, such as those of the dispersal or developed classes, the Ionamine or Cellit dyes, etc. Where dischargeable direct dyes are used upon the saponified

acetate silk, good discharges may be obtained with a 10 per cent solution of Formopon (sodium formaldehyde sulphoxylate).

Sizing for Acetate Silk

Prof. A. H. Grimshaw, of the New Bedford Textile School, has written several papers upon sizing acetate silk which have appeared in the Textile World, 67, 320-1 and 1397-9 (1925). He points out that, due to its different composition, acetate silk presents difficulties in sizing that are not found in sizing cotton and other artificial silks. His work was all done upon Celanese, but the results are all probably just as applicable to Lustron. The experiments indicate that acetate silk may be sized better in a special slasher than in the skein. A number of sizes were prepared and are divided into groups according to the method of preparation. The following is a summary of the methods and results:

Group No. 1 Experiments: General Method of Preparation.—Mix the materials given in the following formulas well with cold water, gradually heat to the boil and work for one hour until well pasted, then make up to volume with water before using. Cool to 38 deg. Cent. (100 deg. Fahr.), dip the skeins, squeeze well, run through the wringer and dry in the air.

Formula—

No. 1.—Forty fluidity cornstarch 3.5, pearl starch 1.5 and water 125.
No. 2.—Forty fluidity cornstarch 1.5, pearl cornstarch 3.5, water 125.
No. 3.—Same as No. 1, plus two parts of softener.
No. 17.—Forty fluidity cornstarch 5, water 125.
No. 19.—Seventy-five fluidity cornstarch 5, water 125.
No. 21.—Gelatin 1, glucose 1, softener 1, fifty fluidity cornstarch 5, water 125.
No number.—Fifty fluidity cornstarch 5, water 125.

Group No. 2 Experiments: General Method of Preparation.—Soak the materials given in the formula overnight in water; boil fifteen minutes (strain in the case of Irish moss) and make up to volume. Apply as in the case of the first group, i. e., at 38 deg. Cent. (100 deg. Fahr.).

Formula—

No. 6.—Gelatin 2, water 200.
No. 7.—K gum 5, water 200.
No. 8.—Gum tragasol 8, water 200.
No. 16.—Kasagra gum 5, water 200.
No number.—Irish Moss 10, water 200.

Group No. 3 Experiments: General Method of Preparations.—Boil thirty minutes, bring up to volume, cool and apply as in the case of the others at 38 deg. Cent. (100 deg. Fahr.).

Formula—

No. 9.—Soluble potato starch 5, water 100.
No. 10.—Potato starch 5, water 100.
No. 11.—Jelly glaze 1, water 32.
No. 12.—Yellow dextrin 5, water 100.
No. 13.—White dextrin 5, water 100.
No. 15.—Amidex 5, water 100.
No. number.—Cornstarch 9.5, Arcy 0.5, water, 250.

The regular Celanese size, as supplied by the manufacturers, was also applied at 60 deg. Cent. (140 deg. Fahr.) in a one to three dilution. After drying the sizes were graded into classes on the various properties as shown by the sized skeins, such as softness, appearance, etc. In each case Class No. 1 is the best, No. 2 next to the best, etc.

Grading for Appearance

Class No. 1 (Best)—

K gum,
Gum tragasol,
White dextrin,
Irish Moss.

Class No. 2 (Good)—

Formula No. 3,
Soluble potato starch,
Potato starch,
Kasagra gum,
One per cent gelatin,
Cornstarch plus arcy,
Formula No. 21.

Class No. 3 (Fair)—

Formula No. 1,
Formula No. 2,
Yellow dextrin,
Celanese size,
Forty fluidity cornstarch,
Jelly size.

Grading for Softness

Class No. 1 (Best)—

Formula No. 3,
K gum,
Amidex.

Class No. 2 (Good)—

Soluble potato starch,
Potato starch,
Yellow dextrin,
White dextrin.

Kasagra gum,
Gelatine,
Cornstarch plus arcy,
Formula No. 21.

Class No. 3 (Fair)—

Formula No. 1,
Formula No. 2,
Forty fluidity cornstarch,
Jelly glaze,
Irish moss.

Class No. 4 (Poor)—

Celanese size,
Fifty fluidity cornstarch,
Seventy-five fluidity cornstarch.

Grading for Binding Properties Under the Pick Glass.

Class No. 1 (Best)—

Formula No. 1,
Gelatin,
Celanese size,
Cornstarch plus arcy.

Class No. 2 (Good)—

Formula No. 2,
Formula No. 3,
Soluble potato starch,
Potato starch,
Forty fluidity cornstarch,
Jelly glaze,
Fifty fluidity cornstarch,
Seventy-five fluidity cornstarch,
Formula No. 21,
Irish Moss.

Class No. 3 (Fair)—

K gum,
White dextrin.

Grading by Pulling the Sized and Dried Yarn Over the Thumb Nail for Separation or Breakage.

Class No. 1 (Best)—

Formula No. 1,
Formula No. 2,
Fifty fluidity cornstarch,
Seventy-five fluidity cornstarch,
Formula No. 21.

Class No. 2 (Good)—

Formula No. 3,
Gelatin,
Celanese size,
Forty fluidity cornstarch,
Cornstarch plus arcy,
Jelly glaze.

Class No. 3 (Fair)—

K gum,
Gum tragasol,
Yellow dextrin,
Kasagra gum,
Irish Moss,
Potato starch.

Class No. 4 (Poor)—

Soluble potato starch,
White dextrin,
Amidex.

Weighing the sized skeins showed that they retained the following quantities of size, based upon the weight of the original skein. Celanese size, 10.21 per cent; gelatin, 4.29 per cent; potato starch 4.84 per cent; 75 fluidity cornstarch, 5.37 per cent; formula No. 21, 5.37 per cent; Formula No. 1, 5.91 per cent, and formula No. 3, 3.17 per cent.

The Removal of Sizing

In desizing acetate silk-cotton unions, previous to bleaching, it is, of course, impossible to use the kier boil, or other strongly alkaline treatment usually given to cotton, on account of the saponifying action of the alkali upon the acetate silk. Tests made by Professor Grimshaw, Textile World 67, 579-81 (1925), upon the complete removal of sizing materials from acetate silk-cotton unions containing such materials as modified cornstarch, Celanese size, gelatin, potato starch, and a combination of gelatin, starch, and glucose, show that the size is removed from the acetate silk easier than from the cotton in the fabric. The usual Celanese union scour, as given in Method No. 2, but for two hours, removes the sizing from the Celanese completely, but the iodine test shows starch still present on the cotton and on bleaching a good white is not obtained.

A modified scour, using soap and soda as on viscose-cotton unions, but at 80 deg. Cent. (176 deg. Fahr.) also fails to remove the starch from the cotton completely. Enzyme solutions, such as a 5 per cent solution of diastofor at 60 deg. Cent. (140 deg. Fahr.), for thirty minutes, or a 3.5 per cent rapidase solution at 80 deg. Cent. (175 deg. Fahr.) for about fifteen minutes, appears to render the starch completely soluble upon washing the fabric in water. Professor Grimshaw recommends a modification of Method No. 2 for this scour, using about 2.5 g. of olive oil soap and an equal amount of emulsified mineral oil per liter, such as is used in raw silk scouring, in place of the ammonia and Turkey Red oil. By either method, the fabric should be scoured for about an hour. Upon bleaching this fabric by Method No. 10, either with or without acetic acid, a good white is obtained on both the Celanese and cotton. The anti-chlor treatment, as in Method No. 13, may also be used to advantage.

Another method of removing difficult sizing materials

is to pad the goods in a hot aqueous solution of soluble oil. They should then be rolled up and allowed to stand overnight, and then scoured for at least an hour as in Method No. 2. According to German Patent No. 395,-829, June 17, 1923, to the Societe pour la Fabrication de la Soie "Rhodiaseta," neutral potassium salts are of some value in scouring for the removal of size. It recommends a soap bath containing such a salt for the removal of sizing, or in degumming the natural silk in real silk-acetate silk unions. The neutral salt is claimed to protect the acetate silk from hydrolysis, but does not decrease the lathering power of the soap.

Finishing Acetate Silk Materials

The finishing of acetate silk fabrics, knit goods, etc., is an art in itself about which very little has been written. In the main it consists of tentering, light calendering, rotary pressing, or breaking where necessary, according to the material and finish required. Possibly the experience and formulas used in finishing the other artificial silks will be the best guide in handling these fabrics, etc.

A recent patent to Clavel, British Patent No. 206,818. September 19, 1923, covers the production of woolly effects upon acetate silk or fabrics containing it by means of acetic or formic acid at a high temperature. To restrain the effect of the acid, a protective colloid or a salt may be added to the solution. As an example, the fiber is treated at boiling with a dilute solution of acetic acid containing a small percentage of Turkey Red oil. Dull or mat effects are produced by boiling soap solutions, barium salts, or phenolic substances. Dreyfus attempts to prevent the production of woolly effects on coarse acetate silk fibers, according to British Patent No. 217,-287, March 7, 1923, by spinning the fibers from solutions containing less than 20 per cent of cellulose acetate.

The Uses of Acetate Silk and Cellulose Acetate

From the foregoing it will readily be seen that acetate silk has a wide variety and rapidly growing number of uses, not only in the textile industry but also in others. The parent product, cellulose acetate, is also widely used for such purposes as aeroplane dope, lacquers, films, molded articles, solidified alcohol, special finishes, waterproofing, special thickener for printing pastes (Sericose L), electrical insulation, etc. It is claimed that a mixture of 10 per cent of cellulose acetate and 90 per cent of alcohol gives a solid tablet of excellent fuel value. The Sericose L, mentioned above, is cellulose triacetate in alcohol and acetic acid solution. It may be used as a thickener and agglutinant in printing and for special effects on fabrics, as well as for waterproofing, for films, etc.

Acetate silk may be used alone in fabrics or in combinations with all other fibers such as cotton, wool, silk, linen or other artificial silks, either as a considerable part of the fabric as in unions, or merely as a thread effect. Lustron is mostly used in piece dyed goods and is recommended for cross-dyeing into two or three color combinations rather than for solid colors. Celanese is extensively skein dyed, especially in the finer deniers, for use in solid colors both alone and with other fibers. However, Lustron can be skein dyed in any required shade also. On account of its low hygroscopic capacity, acetate silk does not absorb moisture (perspiration) and has a high thermal insulating value. This combined with its low specific gravity makes it ideal for underwear, etc. This low hygroscopic capacity combined with its high electrical resistance, has caused it to largely displace real silk as an electrical insulating material, especially for use in a damp atmosphere.

Precautions

Possibly a few precautions are now in order before closing this series.

(1) Always scour, dye, or otherwise wet process acetate silk at temperature below 85 deg. Cent. (185 deg. Fahr.), and preferably below 80 deg. Cent. (176 deg. Fahr.). While Lustron will withstand higher temperatures, it is best to avoid them where they are not absolutely necessary, as better results on the acetate silk are usually obtained at the lower temperatures.

(2) Avoid the use of strong alkalies on acetate silk, especially on Celanese. Here again Lustron will withstand more than the Celanese, but it is far from immune to their saponifying action. Use only neutral soap solutions in scouring and dyeing wherever possible

(3) Never use mineral acids on acetate silk where it can be avoided. Use acetic acid for all general work, such as dyeing wherever this can be done. Where a stronger acid must be used, formic acid should be substituted if possible. However, it appears to be impossible to diazotize the bases on the fiber without the use of mineral acids, but in this case the time of contact should be reduced to the minimum required for the desired result.

(4) On Lustron, no matter what the dyeing process has been, the last wash or rinse water should contain about one-half ounce of sodium bicarbonate per gallon of water. The goods should then be extracted and dried without further rinsing. In finishing or sizing Lustron, the materials should be very slightly on the alkaline side.

(5) If it is necessary to run the acetate silk over copper drying cans, the first two or three of these should be cotton lapped. Do not run the acetate silk over hot calendar rolls or allow it to come into contact with hot steam pipes, etc. Even in drying the best results are obtained at temperatures below 85 deg. Cent. (185 deg. Fahr.).

(6) In finishing acetate silk or goods containing it, never stretch the goods to more than the gray goods width, so as to preserve the original strength of the acetate silk.

(7) In laundrying it should be handled in the same manner as real silk, rather than as cotton.

With proper manipulation it is now possible to dye

acetate silk to almost all shades of excellent fastness without altering its physical, chemical or textile properties, and, of course, retaining its original luster, etc. A supplementary installment of this series will follow, giving various information which was received too late to be included under the proper heading.

Foreign Dyes Imported Through New York and Other Ports During September

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg, near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1835.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

IMPORTS of foreign dyes through the port of New York during the month of September totaled 275,713 pounds, with an invoice value of $264,801. Imports through other ports included: Albany, 14,148 pounds, valued at $13,931; Boston, 8,849 pounds, valued at $6,803; Chicago, 100 pounds, valued at $70; Philadelphia, 48 pounds, valued at $37.

Imports of Synthetic Dyes

1925—	Pounds	Invoice Value
January	403,984	$359,376
February	373,259	365,268
March	527,964	488,501
April	451,005	426,141
May	370,271	347,904
June	376,668	333,654
July	675,843	692,615
August	330,674	303,612
September	298,858	285,642
Total, nine months	3,808,526	$3,602,713

1924—	Pounds	Invoice Value
January	283,643	$237,868
February	161,869	180,570
March	302,799	307,247
April	176,550	183,789
May	183,079	177,553
June	153,019	156,857
July	143,680	139,558
August	80,396	87,014
September	160,978	159,620
Total, nine months	1,601,013	$1,630,076

Five Leading Dyes, by Quantity, Imported During September

	Pounds
Indanthrene Blue GCD (single strength)	16,421
Ciba Scarlet 2G Paste	9,813
Indanthrene Yellow G, R (single strength)	8,926
Anthraflavone GC (single strength)	8,213
Brilliant Indigo 4B Paste	6,412

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
January 31, 1925	571,371	952,202
February 28, 1925	566,038	961,406
March 31, 1925	653,020	1,050,539
April 30, 1925	668,365	1,048,334
May 31, 1925	734,705	1,087,745
June 30, 1925	825,528	1,171,383
July 31, 1925	775,916	1,378,837
August 31, 1925	767,431	1,363,760

Per Cent of Dyes by Country of Shipment

	1925				
	Sept.	Aug.	July*	June	May
Germany	62	51.5	57	50	50
Switzerland	21	36	32	32	32
Italy	3	4	2	5	4
England	3	3	3	4	6
France	2	3	1	3	2
Belgium	5	1	1	3	2
Canada	2	1	3	2	3
Holland	2	0.5	1	1	1

*These percentages do not include imports through the port of Albany.

The dyes in this report are grouped by both Colour Index and Schultz numbers, and in the case of those which could not be identified by either number the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

DYES OF COAL-TAR ORIGIN*

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
27	38	Orange Crystals—(B)	30
40	58	Alizarine Yellow R—(BDC)	25
44	56	Nitrosamine Red Paste—(B) Phenomenal Red M—(S)	700
53	61	Dahlia Violet—(Q)	22
54	64	Sorrel Red X—(B)	680
128	119	Diamine Rose GD—(C)	100
145	140	Jasmine High Conc.—(G)	1,102
241	220	Pilatus Black SF—(B)	1,000
278	—	Chlorantine Fast Red 7BL—(I)	1,102
307	265	Acid Milling Black B—(G)	3,858
316	273	Diaminogene Blue NA—(C)	4,948
319	—	Benzo Fast Heliotrope BL—(By)	1,481
325	—	Diamine Fast Violet FFBN—(C)	50
326	279	Benzo Fast Orange WS—(By)	100
377	315	Congo Orange G—(A)	25
403	—	Diphenyl Fast Gray BC—(G)	661
409	339	Diamine Orange B—(C)	500
430	—	Polar Red G Conc.—(G) Polar ed RS Conc.—(G)	2,751
436	358	Acetopurpurine 8B—(A) Chloramine Red 8BS—(By) Chlorantine Red 8BN—(I) Toluylene Red—(GrE.)	2,167
443	—	Acid Milling Red G Conc.—(G)	1,102
459	373	Congo Orange R—(By)	100
487	400	Acid Anthracene Red 3B—(By)	331
516	423	Diaminogene Blue NBB—(C)	301
622	10	Stilbene Yellow 3GX—(B)	500
639	22	Supra Light Yellow 2GL—(By)	882
652	29	Eriochrome Red B—(G)	2,200
663	500	Setocyanine—(G)	110
657	503	Guinea Fast Green 3B—(A) Poseidon Green SGX—(B)	700
673	508	Xylene Blue AS Conc.—(S)	273
677	512	Magenta AB Powder—(B)	100
678	513	New Magenta O—(M)	10
682	518	Ethyl Violet—(B)	500
695	527	Acid Violet 4BLO—(M)	50
697	529	Acid Violet 6B—(A)	100
699	531	Eriocyanine AC—(G)	2,582
710	541	Direct Brilliant Blue 8B—(I)	220
712	543	Brilliant Acid Blue V—(By) Patent Blue V—(M) Poseidon Blue BGX Conc.—(B)	1,900
714	545	Kiton Blue A—(I) Poseidon Blue BR Ex.—(B)	1,581
715	546	Blue Extra—(C)	1,500
717	548	Acid Violet 6BN—(I) Acid Violet 6BNG—(G)	771
720	551	Eriochrome Azurol BC—(G)	5,445
722	553	Eriochrome Cyanine RC—(G)	1,102
729	559	Victoria Pure Blue BO—(B)	1,500
735	564	Erio Green B Supra—(G)	1,102
748	579	Sulpho Rhodamine BG—(By) Sulpho Rosazeine B Ex.—(M)	286
749	573	Rhodamine B Conc. (s. s.)—(G) Rhodamine B Ex. (s. s.)—(By) Rosazeine B Ex. (s. s.)—(M) Rosazeine B Ex. Base (s. s.)—(M)	2,900
752	571	Rosazeine 6G Ex. (s. s.)—(M)	1,500
757	580	Fast Acid Violet B—(M)	200
758	582	Acid Violet 4RNOO—(B)	300
788	603	Brilliant Acridine Orange A—(DH)	1,763
789	—	Patent Phosphine G—(I)	551
793	606	Phosphine 3R—(A)	2,000
795	607	Runic (Rheonine) AL Conc.—(B)	300
797	608	Patent Phosphine RRDX—(B)	800
802	—	Quinoline Yellow KT Ex.—(B)	200
827	671	Induline Scarlet—(B)	100
828	672	Azo Carmine GX—(B)	1,500

*This table includes imports through the port of New York to the amount of 275,713 pounds, and also 14,148 pounds through the port of Albany, 8,849 pounds through the port of Boston, 100 pounds through the port of Chicago and 48 pounds through the port of Philadelphia.

Colour Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
829	673	Azo Carmine BX—(B)	
		Rosinduline 2B Bluish--(K)	800
833	—	Wool Fast Blue BL—(By)	1,653
845	687	Methylene Heliotrope Ex. Strong—(M)	
		Rosolane Extra Strong—(M)	520
853	—	Acid Cyanine BF—(A)	500
865	700	Nigrosine T—(B)	330
873	681	Malta Gray J—(P)	1,102
875	923	Fur Black DG—(A)	
		Fur Brown 4R Paste—(A)	
		Fur Gray B—(A)	
		Fur Yellow 4G—(A)	
		Nako RH—(M)	1,525
878	622	Delphine Blue B—(I)	331
879	—	Chromazurine E Powder—(DH)	441
900	641	Celestine Blue B—(By)	5
924	660	Methylene Green W—(G)	1,102
1027	778	Alizarine VI Extra Pure—(B)	6,285
1033	779	Alizarine Orange AO Paste—(BD)	
		Alizarine Orange R Paste—(M)	2,003
1034	780	Alizarine Red S Powder—(Q)	1,683
1039	785	Alizarine Red SDG Paste—(M)	500
1053	—	Alizarine Blue WS Powder—(By)	
		Alizarine Light Blue SE Conc.—(S)	
		Alizarine Saphirol WSA Powder—(By)	6,119
1056	—	Alizarine Emeraldol Green G—(By)	10
1061	801	Anthracene Blue SWGG Powder—(B)	200
1064	—	Alizarine Cyclamine R Paste—(By)	10
1067	804	Alizarine Blue S Powder—(B)	500
1071	808	Alizarine Green S Paste—(BD)	
		Alizarine Green S Paste—(B)	1,919
1073	852	Alizarine Blue JR Powder—(By)	
		Alizarine Direct Violet R—(M)	
		Alizarine Irisol R Powder—(By)	1,009
1077	860	Alizarine Direct Blue BGAOO—(B)	2,725
1080	853	Anthraquinone Violet Powder—(B)	700
1081	864	Anthraquinone Green GXNO—(B)	89
1085	862	Alizarine Blue Black B Powder—(M)	
		Alizarine Blue Black 3B Powder—(By)	1,879
1087	851	Alizarine Leveling Blue B—(C)	750
1088	855	Alizarine Blue SKY Powder—(By)	
		Alizarine Sky Blue B Powder—(By)	2,591
1091	—	Anthra Rubine B—(K)	110
1093	850	Vat Blue WB Powder—(B)	3
1095	759	Anthra Yellow GC Paste—(B)	
		Anthra Yellow GC Paste Fine—(B)	
		Anthra Yellow GC Powder (s. s.)—(B)	
		Helindone Yellow AGC Powder (s. s.)—(M)	
		Vat Yellow GC Paste—(B)	8,213
1096	760	Vat Golden Orange G Paste—(B)	
		Vat Golden Orange G Pst. Fine—(B)	
		Vat Golden Orange G Dbl. Pst. (s. s.)—(B)	
		Vat Golden Orange G Dbl. Pst. Fine (s. s.)—(B)	
		Vat Golden Orange G Powder (s. s.)--(B)	290
1097	761	Vat Orange RRT Paste—(B)	
		Vat Orange RRT Paste Fine—(B)	5,474
1099	763	Vat Dark Blue BO Paste—(B)	
		Vat Dark Blue BO Powder (s. s.)—(B)	
		Vat Dark Blue BOA Paste—(B)	
		Vat Dark Blue BOA Powder (s. s.)--(B)	
		Vat Dark Blue BGO Paste—(B)	
		Vat Dark Blue BGO Powder (s. s.)—(B)	171
1102	765	Helindone Black IBB Dbl. Pst. (s. s.)—(M)	
		Vat Black BB Dbl. Pst. (s. s.)—(B)	
		Vat Black BB Powder (s. s.)—(B)	1,628
1103	766	Violet R Extra Powder (s. s.)--(B)	13
1104	767	Vat Brilliant Violet RR Paste Fine—(B)	
		Vat Brilliant Violet RR Powder (s. s.)—(B)	
		Vat Brilliant Violet RRP Powder—(B)	
		Vat Violet RR Ex. Dbl. Paste (s. s.)—(B)	1,971
1105	768	Vat Violet B Paste Fine—(B)	
		Vat Violet B Powder (s. s.)—(B)	57
1106	838	Vat Blue RSP Powder—(B)	
		Vat Blue RSP Triple Powder (s. s.)—(B)	13
1109	840	Vat Blue 3G Powder (s. s.)—(B)	33
1110	841	Vat Blue GGSL Pdr. (s. s.)—(B)	
		Vat Blue GGSP Triple Powder (s. s.)—(B)	
		Vat Blue GGSZ Triple Powder (s. s.)—(B)	53
1111	844	Vat Blue 5G Powder (s. s.)—(By)	2,832
1113	842	Helindone Blue IGCD Dbl. Pst. (s. s.)—(M)	
		Vat Blue GCD Dbl. Pst. (s. s.)—(B)	
		Vat Blue GCD Dbl. Pst. Fine (s. s.)—(B)	
		Vat Blue GCDN Powder (s. s.)—(B)	16,421
1114	—	Vat Blue BCS Powder (s. s.)—(B)	2,516
1115	843	Cibanone Blue G Powder—(I)	
1118	849	Vat Yellow G Dbl. Pst. (s. s.)—(B)	
		Vat Yellow G Dbl. Paste Fine (s. s.)—(B)	
		Vat Yellow G Powder (s. s.)—(B)	
		Vat Yellow R Dbl. Pst. (s. s.)—(B)	
		Vat Yellow R Dbl. Pst. Fine (s. s.)—(B)	
		Vat Yellow R Powder (s. s.)—(B)	8,926
1120	867	Anthra Brown B Paste—(B)	429
1132	817	Helindone Yellow JGK Powder (s. s.)—(M)	456
1133	819	Algol Red R Extra Powder (s. s.)—(By)	800
1134	821	Grelanone Violet 3B Powder—(GrE)	880
1135	820	Grelanone Violet BR Powder (s. s.)—(GrE)	544
1142	830	Anthra Red RT Powder (s. s.)—(B)	26
1143	827	Anthra Bordeaux R Paste—(B)	
		Anthra Bordeaux R Powder (s. s.)—(B)	2,471
1145	834	Vat Gray GK Paste—(By)	800
1151	—	Helindone Brown IR Paste—(M)	1,886
1152	—	Vat Brown G Paste—(By)	798
1161	871	Vat Red Violet RRK Paste—(B)	
		Vat Red Violet RRK Paste Fine—(B)	
		Vat Red Violet RRK Pdr. (s. s.)—(B)	114
1162	831	Helindone Red IRK Powder (s. s.)—(M)	
		Vat Red RK Paste—(B)	
		Vat Red RK Paste Fine—(B)	
		Vat Red RK Powder (s. s.)--(B)	
		Vat Red RKP Paste—(B)	
		Vat Red RKP Powder—(B)	3,701
1163	832	Vat Violet BN Paste--(B)	
		Vat Violet BN Paste Fine—(B)	
		Vat Violet BN Extra Paste—(B)	
		Vat Violet BN Powder (s. s.)—(B)	762
1178	876	Indigosol O—(By)	500
1184	881	Indigo 4B Paste—(M)	
		Brilliant Indigo 4B Paste—(B)	6,412
1188	884	Brilliant Indigo 2B Paste—(B)	100
1189	887	Brilliant Indigo 4G Powder (s. s.)—(B)	1,500
1190	885	Brilliant Indigo B Paste—(B)	2,463
1196	890	Ciba Yellow G Paste—(I)	551
1208	919	Ciba Bordeaux B Paste—(I)	1,102
1211	910	Anthra Pink AN Paste—(B)	
		Anthra Pink BN Paste—(B)	1,500
1212	918	Vat Red Violet RH Powder (s. s.)—(B)	16
1217	913	Hydron Orange RF Paste—(C)	
		Thioindigo Orange R Paste—(K)	2,925
1227	992	Thioindigo Brown G Paste—(K)	1,000
1228	907	Anthra Scarlet GC Paste—(B)	
		Anthra Scarlet GG Powder (s. s.)—(B)	

(Continued on page 708)

MEN OF MARK

in the field of dyes and their application

HERMAN A. METZ

President

General Dyestuff Corporation

HERMAN A. METZ was born in the City of New York, October 19, 1867. The date of this issue accordingly coincides with his fifty-eighth birthday. After attending grammar and high schools he entered the dyestuff field in 1881 as office boy to P. Schulze-Berge, an importer. He followed the fortunes of this gentleman and his successors through various consolidations and changes in firm name, constantly advancing, until in 1898 he became owner and president of Victor Koechl & Co., whose chief business was the American sales agency for the Farbwerke, vormals Meister Lucius & Bruening, of Hoechst, a/M. This agency he continues to control.

Victor Koechl & Co. was later succeeded by two new companies—H. A. Metz & Co. and H. A. Metz Laboratories, Inc.—the former carrying on the dyestuff business and the latter the pharmaceutical. In 1904 Mr. Metz organized the Consolidated Color & Chemical Company, of Newark, N. J., and later acquired a large interest in the Central Dyestuff & Chemical Company, also of that city. The dyestuff manufacturing operations of both of these companies were greatly enlarged during the war, and at the same time the H. A. Metz Laboratories, Inc., took up the manufacture of Salvarsan, Novocain and other greatly needed pharmaceuticals.

In July, 1925, Mr. Metz's entire dyestuff selling interests were turned into a new concern, the General Dyestuff Corporation, of which he is president. Since its formation the General Dyestuff Corporation has also become the American representative of Leopold Cassella & Co. and other European manufacturers, as well as sales agent for the Grasselli Dyestuff Corporation.

Outside of the dyestuff and pharmaceutical fields Mr. Metz owns the Textileather Company, of Newark, N. J., and the Ettrick Mills, of Auburn, Mass. He has also had a long and varied public career, being at different times Comptroller of the City of New York, a member of Congress, a member of the Board of Education of Brooklyn and of New York City, a member of the State Board of Charities, a Director of the Interborough Rapid Transit Company acting for the public, a Colonel and Ordnance Officer of both the New York National Guard and the United States Army Officers' Reserve Corps. He is a director of many banks and a member of a great number of chemical and industrial societies. He has received from Union College the Degree of D.Sc. and from Manhattan College that of LL.D.

AMERICAN
DYESTUFF REPORTER
SAMPLE SWATCH QUARTERLY

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
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SIFTING OUT THE FACTS

WITH announcements of a formidable German chemical merger appearing in the press on an average of three times a week during the past six months and with supplementary comment of a somewhat pessimistic character cropping out now and then in addresses before dyestuff and textile groups, there has arisen a deal of confusion over what appears to be a growing foreign menace. What it all amounts to when sifted down to its essential facts is the question propounded by those who are too busy filling orders to do the sifting for themselves.

It recalls a prediction that first appeared in one of the early Government Dye Census reports and that has since appeared in each census thereafter, viz.: "The existing capacity to produce in excess of normal requirements cannot fail to result in an era of severe competition in the world's markets, and will finally eliminate many of the plants now producing dyes."

There, in direct and uncompromising language, you have the whole cause and effect of all the so-called evils and of any existing depression in the dye industries of this country or of England, France, Germany, Japan or elsewhere.

Alarmists with a barrage of questionable statistics have brought on most of the confusion that may prevail in our industry over approaching disaster from foreign competition. But when the facts, as aforesaid, are set in a row, one against the other, that which may have first appeared ominous is seen in its relation to a silver lining of counteracting conditions.

Those who unduly emphasize foreign developments in the dyestuff industry point out, first, that our industry must soon face the threatening advances of a soundly interlocked amalgamation of unlimited strength and resources—the newly-formed German chemical trust, closely co-ordinated at the producing end abroad as well as at the distributing end in this country; that this formidable combination seeks advantageous trade agreements with England, Japan and China and other dye-consuming countries, which will shut out American products; that it is slowly but surely recovering its export markets; that since the reduction, over a year ago, in the Fordney-McCumber tariff schedules on dyestuffs, our dye imports have greatly increased and that Germany is sending over half of these imports; and what is more, that a drive is already afoot to further reduce the tariff on the plea that Germany must sell her goods here to get money to pay her accumulated loans.

What facts can the American industry pile up against these? A wide range of dye products established in the domestic market and to some extent abroad—products that no longer need be defended nor sold on false claims—products at prices that no consumer can reasonably refuse; control of over 90 per cent of the domestic consumption of coal tar dyes; production of more than one hundred fifty new colors during the past two years, with additions being announced continually; research expenditures in excess of $25,000,000 since 1917—very encouraging, though hardly adequate; and last, but most important, tariff protection—these are some of the more obvious facts to which our industry can point with some satisfaction.

When one fact is weighed against another and rumors and exaggerated forebodings are discounted, the foreign menace may appear to deserve less consideration than it receives in some quarters. But it exists, nevertheless, not so much as a "menace" but as straight, ungarnished competition that must certainly be reckoned with if the American dyestuff industry expects to put itself on a more profitable basis than at present.

And upon what is this foreign competition built? Almost perfect co-operation in manufacturing and selling. And what does the American industry *lack* that would enable it not only to ride over this competition in triumph but also to perform the riding act in such a manner that quite satisfactory profits would thereby accrue? The answer is the same—almost perfect co-operation in manufacturing and selling.

A counter-movement here against the so-called foreign menace, therefore, resolves itself purely and simply into that which The REPORTER has advocated so persistently—co-ordination of dyestuff manufacturing operations to eliminate the inefficiency and needless duplication of effort in the production of colors that now prevails; and co-ordination of selling interests—in strict accord, necessarily, with the anti-trust laws—to eliminate profit-eating methods of distribution.

The principal excuse for again alluding to a subject with which our readers have long been familiar is the obviously increasing forces that now loom over the horizon in the direction of Europe. In short, it has so far been an industrial drama in which only a part of the cast has had the judgment to act wisely. The

cue is obvious. Let the rest of the cast heed it and substitute some real acting for hopes and good intentions. If they do, there is no occasion to fear a tragic ending.

BUSINESS REVIEWS OPTIMISTIC

Current business surveys agree that present conditions are generally sound and satisfactory and foretell continued business of considerable volume during the winter. This from the September monthly letter of the National City Bank, for example, is highly encouraging: "The trend of business during the past month has been very satisfactory, justifying the expectation that the volume of trade this fall will be the largest the country has ever experienced. The reason for it is that the industries have reached a better state of price relations than has prevailed hitherto since this country entered the war."

The Business Bulletin of the La Salle Extension Institute strikes a similar note when it says: "Business in the near future should travel the safe road of good merchandising, skillful salesmanship, economies in production, intelligent control of stocks, and confident expectation of moderate, though not abounding, prosperity—for a well-balanced economic situation such as that now existing in this country carries with it the promise of stability and of larger volume of business than we have had for some time."

GERMAN CHEMICAL MERGER REPORTED COMPLETE

Recent cables from Germany apparently affirm the reported rumors of a closer reorganization of the German chemical cartel. The merger, it is declared, has been completed and awaits only formal approval of the stockholders.

The United States Department of Commerce, however, has not yet received word from its representatives in Germany regarding this development in the German chemical industry and therefore it has not been officially announced.

When the proposed amalgamation was first reported months ago it was said that the chief deterrent to any move toward a dye trust was the heavy German government corporation tax, but if one is to judge from the latest reports this has been successfully overcome by a reduction of the total capitalization of the combined companies from over 640 million marks in ordinary and preference shares to 75 million renten marks.

It is further stated that the Badische Anilin und Soda-Fabrik will increase its capital to above 600 million gold marks and will assume a new corporation title. The Badische company, together with the six other leading German chemical companies, is included in the new amalgamation.

ESTABLISHMENT OF GERMAN ANILINE FACTORY IN CZECHOSLOVAKIA

According to recent reports a number of German aniline manufacturers have combined in the formation of a Czechoslovak company, to be known as Tofa. The following German manufacturers are included: The Badische Aniline Factory, Agfa, Griesheim and Casella. A factory will be opened at Reichenberg in the near future with a branch in Brunn.

It is the announced purpose of the new company to produce dyes which will compete directly with those being sold by Swiss and French firms which have managed to secure a foothold in the Czechoslovak market. No details as to the amount of production are obtainable, but according to the published announcement every effort will be made "through the use of German technical skill, and the introduction of quantity production to undersell foreign competitors in this market."

GRASSELLI TO ENLARGE INTERMEDIATE PLANT

The Grasselli Dyestuff Corporation has asked for bids for a large new building in which to house its increased manufacture of intermediates. This building will be erected at the corporation's plant in Grasselli, New Jersey.

THE NEOLAN COLORS

Included as a part of this issue is a pattern sheet illustrating the Neolan Colors manufactured by the Society of Chemical Industry in Basle, Switzerland, and sold in this country by Ciba Company, Inc.

This series of colors has the unusual feature of producing shades equal in fastness to most chrome or mordant colors when dyed in an ordinary acid bath.

The shade card in question, which is unusually attractive, illustrates not only some of the Neolan Colors as self-shades, but also a wide range of shades produced by combinations of the Neolan Colors with certain Kiton Fast Colors.

NEWPORT DIRECT FAST BROWN M

A leaflet just issued by Newport Chemical Works, Inc., describes a new product of this manufacturer, Newport Direct Fast Brown M, said to be of great value for dyeing cotton, rayon or silk, either as a self-shade or in combination with other direct dyeing colors. Its general good fastness is improved considerably, particularly to light and washing, through an after-treatment with bluestone and chrome. It will discharge white. In mixed material it dyes rayon heavier than cotton. Lustron and Celanese are slightly stained. Silk may be dyed from either neutral or acid baths.

The leaflet gives its method of application and lists complete dyeing properties. The shade is exhibited on bows of cotton and rayon.

THE REDUCTION PRODUCTS OF AZO DYES

(*Continued from page 687*)

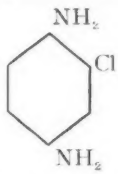
The hydrated phenol ($1H_2O$) gives orange prisms, mpt. 80-90°. The anhydrous comp. melts at 142-3°. Intense sweet taste. Readily sol. in alc., ether or hot water but difficultly sol. in cold water.

With $FeCl_3$ aqueous sols. turn brown and eventually yield brown flakes.

Benzoyl deriv., yellow needles (aniline) or small colorless prisms with rhomb. cross. section. Decomposes above 200°. Insol. in H_2O, difficultly sol. in alc. or HOAc, readily sol. in aniline.

It gives benzene-azo-p-nitrophenol by condensation with nitrosobenzene.

No. 13.—CHLOR-p-PHENYLENEDIAMINE



$C_6H_7ClN_2$; Mol. Wt. 142.56; (C, 50.5%; H, 4.9%; Cl, 24.9%; N, 19.7%).

Derived from: C. I. Nos. 586 and 587 (complete reduction).

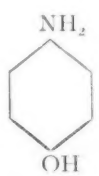
White needles (benzene-ligroin), mpt. 64°, readily sol. in H_2O.

Diacetyl deriv., white, satiny, glittering needles (toluene-alc.), mpt. 196-7° *dibenzoyl deriv.*, white needles ($CHCl_3$), mpt. 228°.

Hydrochloride, colorless needles; *sulfate*, faint rose-colored needles only sl. sol. in H_2O; *platinichloride* and *picrate*, yellow needles.

The base gives *monochlorquinone* by acid oxidation with bichromate. With bleaching powder and conc. HCl it gives monochlorquinone dichlor diimide, faintly brownish-yellow needles, mpt. 83-4°, which gives a violet dye with resorcin and HOAc.

With H_2S and $FeCl_3$ it yields a violet red chlorthiazine dye, with aniline and bichromate a green-blue chlorindamine dye and with phenol and bichromate a corresponding indophenol deriv.



No. 14.—p-AMINOPHENOL

C_6H_7NO; Mol. Wt. 109.09; (C, 66%; H, 6.5%; N, 12.8%; O, 14.7%).

Derived from: C. I. Nos. 95, 134, 350, 364, 379, 583, 586, 589 and 630.

White plates or leaflets, mpt. 184° (decomp.). Sublimes in part unaltered. 100 cc. H_2O dissolve 1.1 gm. at 0°, alc. 1.5 gm. Readily oxidized. Alkaline sols. turn violet in air rapidly.

Monoacetyl deriv., colorless monocl. prisms (H_2O), mpt. 168-9°; *diacetyl deriv.*, leaflets (H_2O), mpt. 150-1°.

Hydrochloride, prisms, sol. in 1.4 parts H_2O at 0°; *acetate*, mpt. 182°; *tartrate*, scales, mpt. 232°; *bitartrate*, mpt. 216°, readily sol. in hot H_2O.

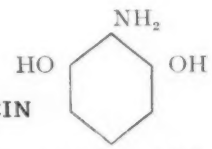
Salts with benzoic, amino-benzoic and sulfanilic acids, see J. pr. Chem. (2) 83, 233.

Condensation prod., with *sym. trinitrobenzaldehyde*, 2, 4, 6-trinitro-benzal-p-aminophenol, yellow, mpt. 179°; with *tetryl*, 2, 4, 6-trinitro-4¹-hydroxydiphenylamine, brick-red needles, mpt. 174°; with *1, 3, 4, 6-bromtrinitrobenzene*, 5-brom-2, 4-dinitro-4¹-hydroxydiphenylamine, garnet-red prisms, mpt. 215-6°; with *γ-trinitrotoluene*, 2-4-dinitro-5-methyl-4¹-hydroxydiphenylamine, garnet-red prisms, mpt. 194° (gives an acetyl deriv. yellow plates, mpt. 144-5°).

Does not yield nitrogen when heated with nitrous acid (general test for amino groups).

A sol. of the hydrochloride poured into a sol. of bleaching powder gives a violet color, turning green on shaking (quinone chlorimide formation).

Is oxidized to quinone by chromic acid, etc.



No. 15.—2-AMINO-RESORCIN

$C_6H_7NO_2$; Mol. Wt. 125.09; (C, 57.6%; H, 5.6%; N, 1.12%; O, 25.6%)

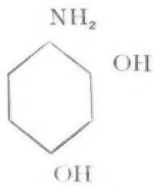
Derived from azo dyes in which resorcin is a component (see following compound).

The free base is unstable.

Hydrochloride, white, well-formed cryst (HCl). Is a strong reducing agent, readily reducing ammon-silver sol. or Fehling's sol. Refluxed with NaOAc and Ac_2O gives *2-acetaminoresorcin diacetate*, colorless needles, mpt. 104°. Condensed with acetoacetic ester (H_2SO_4) get *4-methyl-8-amino-7-oxycumarin*, white needles (alc.), mpt. 269°.

2-benzoylamino-resorcin, slightly brownish leaflets with mother-of-pearl sheen (alc.), mpt. 187°, which gives a nitroso deriv., red needles (toluene), mpt. 208°.

The hydrochloride itself gives a brown insol. nitroso deriv. of a diazo anhydride with nitrite.



No. 16.—4-AMINO-RESORCIN

$C_6H_7NO_2$; Mol. Wt. 125.09; (C, 57.6%; H, 5.6%; N, 11.2%; O, 25.6%).

Derived from: C. I. Nos. 23, 71, 72, 148, 168, 380, 412, 460, 462, 540, 542, 543 and 565.

The free base is unstable.

Hydrochloride ($+2H_2O$), glittering colorless prisms. Is a strong reducing agent. If the aqueous sol. is made slightly alkaline it is colored by the air, first blue, then green and finally yellow-brown. It is colored garnet-red by HNO_3. A strong sol. of $FeCl_3$ gives a deep brown color and then an almost black pptte.

Tribenzoyl deriv., white, silky needles, mpt. 172°, readily sol. in benzene, alc., HOAc and $CHCl_3$ but only sl. sol. in ligroin. It dissolves in H_2SO_4 with a blue-violet color.

Tetraacetyl deriv., mpt. 106-8°, readily sol. in cold benzene, ether, HOAc and $CHCl_3$. It dissolves in H_2SO_4 with a violet color.

(*Part III will appear in an early issue*)

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

INDANTHRENE NAVY BLUE
(Schultz No. 763)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Caustic and hydro at 140 deg. Fahr.

SHADE: Bright Navy.

SOLUBILITY: Does not dissolve in concentrated solution.

FASTNESS TO:
Acid: Fast.
Alkali: Fast.
Chlorine: Excellent.
Light: Fast.
Washing: Excellent.
Spotting: Sensitive, but original shade returns.

MACHINE DYEING: Suitable in vacuum machine for raw stock.

OTHER PROPERTIES: High dyeing temperatures makes the shade duller.

ON OTHER MATERIALS: Silk: Suitable.

PRINTING: Soda ash method suitable. Fast to light, washing, chlorine. Suitable for silk printing.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, Inc., under name of Anthrene Dark Blue BO; American Aniline Products, Inc., under name of Indanthrene Dark Blue BO; E. I. du Pont de Nemours & Co., under name of Ponsol Dark Blue BR.

INDANTHRENE GREEN B
(Schultz No. 765)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Caustic and hydro at 140 deg. Fahr. Requires plenty of caustic; Badische process JN.

SHADE: Yellowish green.

LEVEL: Does not dye level.

FASTNESS (as a Green):
Acid: Fast to acetic.
Alkali: Fast.
Boiling: Fast.
Chlorine: Turns blackish gray.
Cross-Dyeing: Fast.
Ironing: Fast.
Light: Moderate.
Perspiration: Fast.
Potting: Fast.
Rubbing: Fast.
Steaming: Fast.
Sulphur: Fast.
Washing: Fast.

FASTNESS (as a Black):
Chlorine: Fast.
Light: Fast.
Washing: Fast.

SENSITIVE TO METALS, LIME: In chloride of lime ½ deg. Be. the green is completely destroyed after five minutes.

MACHINE DYEING: Suitable.

OTHER PROPERTIES: Suitable for dyeing cops.

DYED BY OTHER METHODS: Dyes cold by Badische process JK; rather weak. Dyes in a dipping vat very heavy shades. In vats dark dyeings can be obtained only in a very concentrated solution.

ON OTHER MATERIALS: Silk: Good affinity; for full shades use 50 per cent paste, 12-15 per cent caustic and 15 per cent hydro at 140 deg. Fahr. To make the black from the green diazotize. Above 50 per cent color has very little effect. To make the black jetter use 10 per cent Indanthrene Yellow G.

PRINTING: Caustic process gives weak shades. Steaming process best.

REMARKS: This color has to be printed with caustic soda, as with soda ash claret shades are obtained.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under name of Amanthrene Green G; Newport Chemical Works, Inc., under names of Anthrene Black BB and Anthrene Green B Double; E. I. du Pont de Nemours & Co., under names of Ponsol Green BN and Ponsol Black B Paste and Powder.

ANTHRENE VIOLET R
(Schultz No. 766)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Caustic and hydro. Requires plenty of caustic; Badische process JN. Below 140 it will not reduce well. Glue precipitates the color.

SHADE: Reddish violet.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Fast.
Alkali: Fast.
Boiling: Fast.
Chlorine: Fast. Twelve-hour treatment with ½ deg. chloride of lime does not affect shade.
Cross-Dyeing: Fast.
Fulling: Fast.
Ironing: Goes bluer; moderate.
Light: Fast.
Rubbing: Fast.
Washing: Fast.
Spotting: Sensitive.

MACHINE DYEING: Not suited.

ON OTHER MATERIALS: Linen: Same general properties as on cotton, though not as fast to ironing.

PRINTING: O. K. by steaming process. Not as full shades by caustic soda process, but brighter and redder. Steaming process suitable for light shades only.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, Inc.

INDANTHRENE VIOLET RR
(Schultz No. 767)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With caustic and hydro at 140. In heavy shades use Glauber salt as well.

SHADE: Extremely reddish when wet.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Easily reduced.

LEVEL: Very poor; use 1 to 2 per cent glue.

EXHAUSTS: Very quickly.

FASTNESS TO:
Acid: Fast.
Alkali: Fast.
Chlorine: Better than S-766.
Cross-Dyeing: Fast.
Fulling: Fast.
Ironing: Does not redden.
Light: Fast, but inferior to S-766.
Rubbing: Fast.
Steaming: Fast.
Washing: Better than S-766.
Water: Sensitive to water spotting.

MACHINE DYEING: Will not penetrate raw cotton in vacuum machine.

DYED BY OTHER METHODS: On warps the color goes on too quickly. Addition of soluble oil retards this somewhat. Dye at 120 in several runs with 1½ per cent oil.

ON OTHER MATERIALS: Linen: Generally the same fastness as on cotton, but not as fast to ironing.

PRINTING: Printed by the Rongalite method, prints of good fastness are obtained. The tin-copperas method developed with hot caustic does not give good results. The fastness of the printed shade to soap and chlorine is good. The colored shade is somewhat bluer. The prints are faster than the prints of S-766.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under names of Anthrene Violet 2R and Indanthrene Violet RR; Newport Chemical Works, Inc., under name of Anthrene Violet RR; E. I. du Pont de Nemours & Co., under names of Ponsol Violet RRD Paste and Powder.

INDANTHRENE GOLDEN ORANGE G
(Schultz No. 760)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Caustic and hydrosulphite at 120 to 140 deg. Cent. Will also dye acid, giving brighter and fuller shades. Above 140, duller and weaker. Soap at least ten minutes at the boil.

SHADE: Bright golden yellow.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Excellent.
Alkali: Excellent.
Boiling: Faster to boiling alkali than the Indanthrene Yellows.
Chlorine: Excellent.
Cross-Dyeing: Excellent.
Fulling: Excellent.
Light: Excellent.
Steaming: Excellent.
Sulphur: Excellent.
Washing: Excellent.
Water: Excellent.
Bowking: Far better than Indanthrene Yellow.

MACHINE DYEING: Suitable.

DYED BY OTHER METHODS: Can be padded; works well in machines. On warps, goes on quickly but evenly. Will dye cold.

ON OTHER MATERIALS: Paper: Very fast to light and alkali. Lakes: Not suited.

DISCHARGING: Rongalite: Not suitable.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co., under name of Ponsol Golden Orange Double.

PONSOL GOLDEN ORANGE RRT
(Schultz No. 761)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Caustic and hydrosulphite. Best at 140. Dyes at higher temperatures weaker and duller.

SHADE: Between 760 and 762.

(Continued on page 712)

FOREIGN DYES IMPORTED DURING SEPTEMBER

(*Continued from page 701*)

		Ciba Scarlet G Extra Paste—(I)	
		Helindone Fast Scarlet C Paste—(M)	
		Thioindigo Scarlet 2G Paste—(K)	9,813
1229	908	Ciba Red R Paste—(I)	5,510

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Blue AM—(By)	627
Acid Blue RBF—(I)	992
Acid Eosine—(Q)	4
Acid Rhodamine BG—(B)	300
Acid Violet 3R—(By)	5
Alizarine Direct Blue A—(M)	500
Alizarine Direct Blue ESR—(M)	547
Alizarine Supra Blue A Powder—(By)	200
Alkaline Blue HE Extra Conc.—(A)	25
Benzyl Fast Blue GL—(I)	220
Brilliant Acid Blue EG—(By)	200
Brilliant Acid Blue FF—(By)	344
Discharge Blue BG Extra—(C)	500
Erio Carmine 2BC—(G)	551
Guinea Brown R—(A)	25
Guinea Fast Red BL—(A)	1,000
Guinea Light Blue A2G—(A)	5
Indocyanine B—(A)	2,000
Kiton Pure Blue V—(I)	1,102
Leveling Silk Blue B—(C)	500
Milling Brown R—(A)	100
Milling Yellow O—(C)	1,000
Minaxo Acid Brown G—(B)	300
Neolan Blue 2G—(I)	2,204
Neolan Pink B—(I)	220
Onis (Anthosine) 3B—(B)	278
Polar Orange GS Conc.—(G)	110
Sulpho Rosazeine G Extra—(M)	10
Supra Cyanine 3FLA—(By)	10
Supra Cyanine 3GLA—(By)	10
Supra Cyanine Brown GLA—(By)	10
Supra Cyanine Gray GLA—(By)	10
Supramine Brown R—(By)	100
Supramine Red B—(By)	200
Supramine Red 3B—(By)	500
Wool Blue RR Extra Powder—(By)	1,102
Xylene Milling Red B Conc.—(S)	500

Vat Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Helindone Brilliant Green D5G Paste—(M)	200
Helindone Brown I2G Powder (s. s.)—(M)	2,400
Helindone Pink R Extra Paste—(M)	2,000
Helindone Printing Black RD Paste—(M)	7,000
Hydron Brown G Paste—(C)	
Hydron Brown R Paste—(C)	1,641
Hydron Olive GN Paste—(C)	500
Hydron Pink FB Paste—(C)	
Anthra Pink B Extra Paste—(B)	2,767
Hydron Scarlet 2B Powder (s. s.)—(C)	300
Hydron Scarlet 3B Paste—(C)	849
Vat Black BGA Powder (s. s.)—(B)	26
Vat Blue GGHZ Powder—(B)	3
Vat Blue RSN Powder (s. s.)—(B)	26
Vat Blue RZ Triple Powder (s. s.)—(B)	10
Vat Blue REZ Powder—(B)	3
Vat Blue RHZ Powder—(B)	3
Vat Blue WBO Powder—(B)	3
Vat Blue 3GP Powder—(B)	3
Vat Blue Green B Dbl. Paste Fine (s. s.)—(B)	
Vat Blue Green B Powder (s. s.)—(B)	1,064
Vat Brilliant Blue R Paste Fine—(B)	
Helindone Brilliant Blue IR Paste—(M)	
Vat Brilliant Blue R Powder (s. s.)—(B)	702
Vat Brilliant Violet RBBA Powder (s. s.)—(B)	13
Vat Brown 3R Powder (s. s.)—(B)	26
Vat Gray BTR Paste—(B)	
Vat Gray BTR Paste Fine—(B)	
Vat Gray BTR Powder (s. s.)—(B)	98
Vat Gray RRH Paste—(B)	
Vat Gray RRH Paste Fine—(B)	
Vat Gray RRH Powder (s. s.)—(B)	98
Vat Gray 3B Dbl. Paste (s. s.)—(B)	
Vat Gray 3B Dbl. Paste Fine (s. s.)—(B)	
Vat Gray 3B Powder (s. s.)—(B)	202
Vat Gray 6B Paste—(B)	
Vat Gray 6B Powder (s. s.)—(B)	55
Vat Green G Dbl. Paste (s. s.)—(B)	
Vat Green G Dbl. Paste Fine (s. s.)—(B)	
Vat Green G Powder (s. s.)—(B)	189
Vat Green GG Dbl. Paste (s. s.)—(B)	
Vat Green GG Dbl. Paste Fine (s. s.)—(B)	
Vat Green GG Powder (s. s.)—(B)	2,153
Vat Khaki GG Paste—(B)	
Vat Khaki GG Powder (s. s.)—(B)	70
Vat Orange 3R Paste—(B)	
Vat Orange 3R Paste Fine—(B)	
Vat Orange 3R Powder (s. s.)—(B)	114
Vat Orange 4R Powder (s. s.)—(B)	16
Vat Orange RRTL Paste—(B)	44
Vat Orange RRTS Powder (s. s.)—(B)	516
Vat Pink B Paste—(B)	
Vat Pink B Paste Fine—(B)	
Vat Pink B Dbl. Paste (s. s.)—(B)	
Vat Pink B Dbl. Past eFine (s. s.)—(B)	
Vat Pink B Powder (s. s.)—(B)	21,822
Vat Printing Black BR Paste—(B)	44
Helindone Red IGG Paste—(M)	
Vat Red GG Paste—(B)	
Vat Red GG Paste Fine—(B)	
Vat Red GG Powder (s. s.)—(B)	1,819
Vat Red RKL Paste—(B)	44
Vat Red Brown R Paste—(B)	
Vat Red Brown R Paste Fine—(B)	
Vat Red Brown R Powder (s. s.)—(B)	1,086
Vat Red Violet RHP Paste—(B)	44
Vat Red Violet RRKP Powder—(B)	44
Vat Violet BNL Paste—(B)	44
at Yellow FFRK Powder (s. s.)—(B)	26
Vat Yellow GP Powder—(B)	3
Vat Yellow RK Paste—(B)	44
Vat Yellow RK Powder (s. s.)—(B)	8
Vat Yellow 3RT Powder—(B)	3
Vat Yellow 3RT Conc. Powder—(B)	3

Mordant and Chrome Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Anthracene Brown PG—(By)	514
Acid Anthracene Red 5BL—(By)	100
Anthracene Chromate Brown EB—(C)	900
Chromanol Violet RI Powder—(DH)	275
Chrome Printing Red B Powder—(DH)	220
Chrome Printing Red Y Powder—(DH)	661
Chromophenine FKN Powder—(DH)	110
Eriochrome Blue S—(G)	551

Name of Dye and Manufacturer	Quantity (pounds)
Eriochrome Violet 3B—(G)	110
Metachrome Blue GFL—(A)	100
Metachrome Blue Black 2BX—(A)	2,000
Metachrome Olive 2G—(A)	500
Metachrome Violet 2R—(A)	100

Direct Dyes

Benzo Bronze—(By)	200
Benzo Fast Blue RL—(By)	1,322
Benzo Fast Bordeaux 6BL—(By)	100
Benzo Fast Brown 3GL—(By)	889
Benzo Fast Gray BL—(By)	2,000
Benzo Fast Heliotrope 4BL—(By)	1,800
Benzo Fast Orange 2RL—(By)	500
Benzo Red 12B—(By)	198
Benzo Rhoduline Red B, 3B—(By)	300
Brilliant Congo Blue 5R—(A)	100
Brilliant Congo Violet R—(A)	200
Chlorantine Fast Blue 4GL—(I)	110
Chlorantine Fast Blue 8GL—(I)	1,102
Chlorantine Fast Brown 3GL—(I)	661
Chlorantine Fast Gray B—(I)	2,645
Chlorantine Fast Orange 2RL—(I)	220
Chlorantine Fast Violet 5BL—(I)	220
Chlorantine Fast Yellow RL—(I)	551
Chlorantine Fast Yellow 4GL—(I)	2,204
Chlorazol Fast Orange AG—(BD)	1,070
Columbia Fast Black V Extra—(A)	100
Columbia Red OBO3B—(A)	300
Cotton Fast Yellow RL Powder—(By)	441
Developed Blue 4GL Extra Powder—(By)	220
Developed Brilliant Orange GR Powder—(By)	441
Developed Brilliant Orange 5G Extra—(By)	441
Developed Brilliant Scarlet 2BL Extra—(By)	2,204
Developed Sky Blue 3GL—(By)	110
Developing Blue B—(A)	1,000
Diamine Fast Brown GB—(C)	500
Diamine Fast Brown GBB—(C)	200
Diamine Fast Brown R—(C)	500
Diamine Fast Brown 3G—(C)	200
Diamine Fast Orange EG—(C)	500
Diamine Fast Orange ER—(C)	500
Diaminogene Blue GG—(C)	117
Dianil Fast Orange 2R—(M)	400
Diazo Fast Black VB—(By)	1,210
Diazo Fast Blue 2BW—(I)	110
Diazogene Light Violet BL—(GrE)	394
Diasophenyl Black V—(G)	2,204
Diphenyl Fast Bronze B—(G)	1,102
Direct Brilliant Fast Violet BL—(By)	441
Direct Fast Violet B Powder—(By)	441
Fast Cotton Brown GB—(A)	5
Fast Cotton Gray VL—(A)	500
Fast Cotton Violet 4R—(A)	200
Naphthamine Light Brown 2G—(K)	336
Minaxo (Oxamine) Black BBNX—(B)	500
Pluto Black G Extra—(By)	1,014
Pluto Brown GG—(By)	100
Rosanthrene Fast Red 7BL—(I)	110
Toluylene Fast Orange GL—(By)	100
Toluylene Yellow G—(By)	100
Triazol Fast Brown G—(A)	10
Zambesi Black F—(A)	1,500
Zambesi Black V—(A)	500
Zambesi Pure Blue 4BG—(A)	100

COLORED GOODS AND THE LAUNDRY

(*Concluded from page 685*)

little and apparently care less about the textiles that they handle. To save time and equipment they insist on washing light-colored work with white pieces that are subjected to the action of Javel water. Others fail to control the washing temperature and the amount of builder being used. The fact remains, however, that gradually this type of laundryowner is being driven out of business by his more up-to-date and efficient competitors, who make every effort to handle their customers' clothes—colored and white—as they should be handled, with care. Dyers should remember the following facts when making up their color lines:

1. Striped and partly colored cotton shirtings are frequently laundered at 140 to 160 deg. Fahr. with soap and alkaline builders because lower temperatures are not as effective for cleaning badly soiled garments.

2. Solid shades in shirtings and similar pieces are never laundered above 120 deg. Fahr.

3. Colored cotton knit underwear is laundered at 120 deg. Fahr. or lower with soap and builder.

4. Woolens and silks, whether colored or not, are laundered between 90 to 100 deg. Fahr. with soap and water only, unless the water is hard, when enough alkali is added to partially soften the water.

5. Overalls are best laundered between 140 to 160 deg. Fahr. with common salt and soda ash. Dyestuffs should be chosen with this thought in mind.

6. Hosiery is never laundered above 100 deg. Fahr., soap alone being used.

7. Colored curtains and similar hangings are laundered with soap at 100 deg. Fahr.

8. Rugs are often shampooed cold with a neutral soap paste and rinsed in cold water.

9. Colored goods are never boiled with soap and soda in a power laundry.

10. Sodium hypochlorite is never used on colored goods by any laundry following the recommendations of the Laundryowners National Association.

[Note—The Laundryowners' National Association, with headquarters at La Salle, Ill., is made up of some 2,000 laundryowners located in both the United States and Canada. For nine years the L. N. A. has supported a Department of Research at Mellon Institute, University of Pittsburgh. During this time the fellowship has studied not only the chemistry of laundering but textiles themselves. To date two books have been published by the Department of Research. "The Conservation of Textiles" (1921) and the "Manual of Standard Practice for the Power Laundry Washroom" (first edition, 1922; second edition, 1924). At present the department is engaged in the preparation of a second book on textiles, treating the problem entirely from a laundry viewpoint. These books are supplemented by monthly and special bulletins. The L. N. A. also supports the following departments, each of which has a director and assistants: Engineering, Accounting, Publicity, and Human Relationships. For the past three years the L. N. A. has supported, through its members, the American Institute Laundry at Joliet, Ill., Dr. A. F. Shupp being resident manager. This institution is patterned after the famous American Institute of Baking at Chicago. Mr. Hoover has called the L. N. A. one of the foremost trade associations of the country.]

Technical Notes from Foreign Sources

Use of Lactic Acid in Textile Industry

Lactic acid is an important textile chemical and is employed generally as an acid reagent, and more particularly in the brightening of wool, silk and cotton, for the mordanting of wool with bichromate. The acid is recommended for this purpose, for its action is much more favorable than that of the mineral acids, particularly sulphuric acid; and, furthermore, it is entirely free from metallic impurities, which is one of the serious disadvantages of mineral acids, for these impurities give rise to the formation of spots and stains in the dyed fabric.

Of course, the ordinary grade of lactic acid cannot be used for this purpose, only that grade marked "Textile" being suitable; for technical lactic acid contains generally as much as ½ to 1 per cent of free sulphuric acid and always a certain amount of iron.

Even when used at high temperatures and in high concentrations, lactic acid does not harm either the animal or the vegetable fibers. Formic acid, oxalic acid, citric acid and tartaric acid all give good results, but none of them is as good for textile purposes as lactic acid.

For example, in the mordanting of wool in a bichromate bath, lactic acid used in the proportion of 50 per cent in weight results in complete fixation of the chrome mordant on the fiber. The mordanting bath may consist of 3 per cent of bichromate and 2.5 per cent of textile lactic acid, 50 per cent in weight. Or the bath may be made from 2 per cent of bichromate, 3 per cent of textile lactic acid, 50 per cent in weight, and 1 per cent of sulphuric acid.

The wool is introduced into this bath at a temperature of 70 deg. Cent., and then the temperature is slowly raised until it attains a maximum of 100 deg. Cent. The liquor is maintained at that point for a period of ninety minutes.

(For further details see Revue Generals des Matieres Colorantes, 1925, 149.)

Hydration of Bleached and Boiled off Cotton

In a series of experiments that were carried out on bleached and boiled-off cotton yarn it was established that the bleached cotton yarn was subjected to a greater degree of swelling or hydration than boiled-off yarn of the same kind. The cause of this striking difference may be sought for in the greater degree of purity or in the greater hydrating capacity of the bleached cotton yarn. In order to be able to explain the phenomena in a concise and exact manner, bleached cotton yarn and boiled-off cotton yarn were examined after being subjected to a fractional dehydration.

In the case where the purity of the yarn alone came up for consideration, it was found that the bleached fiber lost just as much moisture as the boiled-off yarn. On the other hand, when it is hydrated to a greater or lesser degree, the loss of moisture in the cotton that has been bleached becomes relatively less than that which is undergone by the fibers that have just been boiled off.

The tests were carried out in such a manner that cotton yarn (warp 14) was boiled off according to the process used in practical operation, then the yarn was bleached and dried uniformly in air, and thereafter subjected to a dehydration by placing it in a desiccator which was filled with concentrated sulphuric acid. The following results were obtained in this manner:

	—Boiled-Off Fibers—			—Bleached Fibers—		
Duration of Dehydration	Weight Found	Loss	Difference*	Weight Found	Loss	Difference†
24 hours....	95.55	4.45	0.	95.55	4.45	0.
48 hours....	95.11	4.89	—0.44	95.55	4.45	+0.44
72 hours....	94.22	5.78	—0.89	95.11	4.89	+0.89
96 hours....	94.22	5.78	—0.89	95.11	4.89	+0.89
144 hours....	94.22	5.78	—0.89	95.11	4.89	+0.89

*In comparison with bleached fibers. †In comparison with boiled-off fibers.

(Bull. Soc. Ind. Mulhouse, 1924, 557.)

Mercerization With the Aid of Nitric Acid

Cotton dyes badly with the acid coloring matters, as these colors cannot penetrate deeply into the internal structure of the cotton fiber. Hence, when cotton materials are dyed with this class of coloring matters it is well not to wash the fabric but simply to press out the excess coloring matters and then dry the material. But when the cotton fiber is first mercerized with the aid of nitric acid, then a marked change is effected in it so that it readily absorbs the acid coloring matters. It is also a fact that when the cotton fibers are mercerized with the air of nitric acid, the action on them is more favorable, so far as dyeing with the acid coloring matters is concerned, than when the fibers are mercerized in the ordinary manner with the aid of caustic soda lyes. Furthermore, the luster of the fabric, which is mercerized by means of nitric acid, is comparable in every way with that of the fabric which is mercerized with the aid of caustic soda.

A series of tests were made on the nitric acid mercerization of the cotton fiber and the results of these experiments were reported in Melliands Textilberichte, 1925, pages 661 to 662. The nitric acid treatment of the cotton fiber has the effect of improving the general properties both of the cotton yarn and of the cotton fabric, and it particularly increases the capacity of the fiber to absorb coloring matters.

The general results that were obtained in this series of experiments are given below:

1. The length of the cotton fibers was shortened by about 10 per cent, and at the same time the strength of the fiber was increased about 20 per cent.

2. The most effective temperature at which the nitric acid treatment can be carried out is from 15 to 28 deg. Cent.

3. The most favorable concentration of nitric acid is approximately 40 to 41 deg. Be.

4. The duration of the nitric acid treatment varies between rather wide limits. It is dependent on the character of the coloring matter that is employed in the dyeing process. The duration of treatment varies between thirty seconds and twenty-one hours.

5. It has been observed that the affinity of the fiber for a coloring matter increases progressively up to a certain definite limit, and that this limit is dependent on the duration of the treatment with nitric acid—for example, up to a period of twelve hours; but then this affinity begins to fall again. Hence, in order to counteract or avoid the harmful action of the nitric acid when it is allowed to remain in contact with the fibers indefinitely, it is necessary to subject the treated materials to a most careful washing with pure water. It is even better to employ a dilute solution of sodium carbonate containing about 1 to 2 grams of the alkali to the liter of water, or else a solution of sodium sulphide may also be employed to advantage.

6. Although in many cases the highest attainable degree of brilliancy and depth of color in the dyeing process is obtained after the treatment with the standard concentration nitric acid, as mentioned above, for a period of twenty-one hours, nevertheless so long as mercerization is not feasible for the reason that the fiber suffers too much from its long contact with the acid. When the temperature at which the process is carried out is decreased, then the weakening action of the acid on the fibers is reduced; but, on the other hand, the affinity of the treated fibers for the coloring matters is also reduced.

After the cotton fibers have been treated for a period of a few minutes with nitric acid of 40 to 41 deg. Be. concentration, they attain the capacity of dyeing more deeply with the usual coloring matters used in the usual dyeing process than when the untreated fibers are dyed. After a three hours' treatment the intensity of the color produced on the fibers is at a maximum. When the treatment with nitric acid is continued, then the absorptive qualities of the fibers as well as its mechanical strength are impaired. It may also be mentioned that the treatment with nitric acid serves to increase the resistance of the colored fabric to washing and to soap. Cotton fibers which have been treated in accordance with the above nitric acid process can be dyed with good results with the aid of substantive, sulphur, azo and vat coloring matters, and deeper and more brilliant shades are obtained than when the fibers are not subjected to the nitric acid treatment. A treatment lasting only from thirty seconds to five minutes with nitric acid is sufficient to bring about the desired results. Depth of color is obtained and, in addition thereto, the consumption of coloring matter is much less and the light and soaping resistance of the dyed fabrics is enhanced.

Suction Dyeing Textile Materials

Apparatus which is especially suitable for dyeing textile materials with sulphur coloring matters comprises a dyeing chamber which is connected with a closed upright cylindrical dye liquor container which is divided into upper and lower chambers by means of a horizontal partition. The dye liquor which is in the lower part of the container is drawn into the dyeing chamber. A portion of the dye liquor is then returned to the lower part, being pumped hard upward against the partition so that much froth is produced. In this case a dye liquor which contains froth-inducing substances is employed. The frothy liquor then rapidly returns to the dyeing chamber, thereby saturating the dyed material.

Subsequently, air is drawn through a valve in the top of the dyeing chamber, so that all the froth in the dyed material is just displaced and the color of the latter is developed by resulting atmospheric oxidation, admission of air to the dye liquor being avoided. (British Patent No. 236,617.)

Dyeing Fabrics, Furs, Etc.

A black pigment is made by grinding in a colloid mill a mixture of carbon which is obtained by the low temperature carbonization of vegetable matter or animal matter or of peat, with artificial or natural tanning materials or ink-forming substances or with compounds of these with heavy metals. The resulting pastes or emulsions are used for printing on fabrics, or as a dye bath for cotton, wool or artificial silk. For example, a mixture of soot, tannin, gallic acid and water is ground in a colloid mill and ferrous sulphate is added. The ink constituents act as accelerators and protective colloids in rendering the carbon colloidal. (German Patent No. 413,239.)

Improving Vegetable Textile Materials

A high degree of transparency and a brilliant silky luster, or a stiff finish, or a combination of these effects, may be imparted to vegetable textile materials, particularly cotton, by the simultaneous or preferably successive action in either order of a mono-halogen derivative of a fatty acid, or of a salt of a fatty acid, and an alkali. It is of some advantage to pass the treated fabric, before it is passed through the washing apparatus, through a fixing bath which contains a mineral or an organic acid, or any of the precipitants which are commonly employed in the viscose or cuprammonium silk industry.

If a high silky luster is required the material must be stretched during the whole or a part of the operation. Pattern effects, such as a lustrous design on a dark background, or vice versa, may be obtained in the usual manner by limiting the area of reaction of either the alkali or the chlorinated fatty acid.

Bleached or unbleached, mercerized or unmercerized cotton is impregnated with 25 to 40 per cent of a caustic soda solution for a period of five minutes to twelve hours at the ordinary temperatures, and is then squeezed until it contains 2.5 to 3.5 times its weight of liquor. The im-

pregnated material is then treated either immediately or after standing for a period of three to seventy-two hours with sodium mono-chloroacetate. The latter compound may be prepared, for example, by dissolving 100 parts of mono-chloroacetic acid in 100 parts of water or of a 20 to 25 per cent solution of British gum, and adding to the solution in small quantities and with constant agitation 90 parts of sodium hydrogen carbonate. Fifty to 100 parts of sodium chloroacetate per 100 parts of cotton is a suitable quantity and may be employed either at the ordinary temperature as a crystalline suspension or in the state of a clear solution at a temperature varying between 50 and 60 deg. Cent. After a time, which may vary from ten minutes to twelve hours, the fabric is transferred into a bath of, for example, 10 to 20 per cent of sulphuric acid or acetic acid, and is subsequently washed and dried. The prolonged action of soda and mono-chloroacetic acid produces a stiff finish. Alcohol may be present or may be the solvent in the impregnation baths. (British Patent No. 231,803.)

DYESTUFF TABLES

(*Continued from page 707*)

SOLUBILITY: Reduces easily.

LEVEL: Little better than Indanthrene Scarlet G (S-762).

EXHAUSTS: Fairly well.

FASTNESS TO:

Acid: Excellent.
Alkali: Excellent.
Chlorine: Excellent.
Cross-Dyeing: Excellent.
Ironing: Yellower.
Light: Excellent.
Potting: Excellent.
Rubbing: Fast.
Steaming: Yellower.
Sulphur: Excellent.
Washing: At a boil the shade goes yellower but does not bleed.
Bowking: Poor; Ludigol selps.

SENSITIVE TO METALS, LIME: Sensitive to lime, which makes the shade weaker; but better in this respect than S-762. Correct hard water with 1 to 2 pounds of soda ash per 100 gallons.

OTHER PROPERTIES: Algol Orange R is redder (S-824). Algol Brilliant Orange FR is brighter and redder. Helindone Orange GRN is duller and redder.

DYED BY OTHER METHODS: Dyes cold. Suitable for pad dyeing. Suitable for dipping vat.

ON OTHER MATERIALS: Paper: O. K.

PRINTING: Soda process with steaming heat. Fast to soap, chlorine and light. Fixes well.

DISCHARGING: Rongalite insufficient.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co., under name of Ponsol Golden Orange RRT.

The business formerly carried on by Joseph Brandwood is now controlled by Joseph Brandwood & Son, Park Square Building, Boston. In the future, it is announced, all machinery and equipment for sale in the United States by this firm will be manufactured in this country, where experience has shown advisable.

This company controls the Brandwood patents covering the bleaching and dyeing of beams and packages, continuous raw stock dyeing machines, continuous bleaching and finishing machines for rayon and automatic skein dyeing machines for rayon.

SALES MANAGER—EXECUTIVE

Thirty years' varied experience in the dyestuff business, associated with the most representative importing and domestic houses, holding positions of wide responsibility. Thorough acquaintance with all types of dyestuffs, and requirements of prominent consumers. Unqualified credentials. Presently available. All communications confidential. Address Box 313, American Dyestuff Reporter.

POSITION WANTED

Consulting textile chemist and dyer; experienced in analyzing and testing out dyestuffs, soaps, oils, softeners, gums and chemicals, for their best money value. Also experienced in testing yarns, cloths and silks. Dyeing experience: raw wool and cotton, worsted yarns and cotton, piece dyes of all kinds, union goods, mixed piece dyes made up of cotton, artificial and tram silk, shoddy, rags, stripping and bleaching, carbonizing and mercerizing. American, 45; best of references; familiar with all kinds of dyeing machines. Address Box 316, American Dyestuff Reporter.

DYER WANTED

Man fully familiar with the handling and dyeing of piece goods, especially glove silk jersey cloth. A very good opportunity. Give full details in confidence to Box 319, American Dyestuff Reporter.

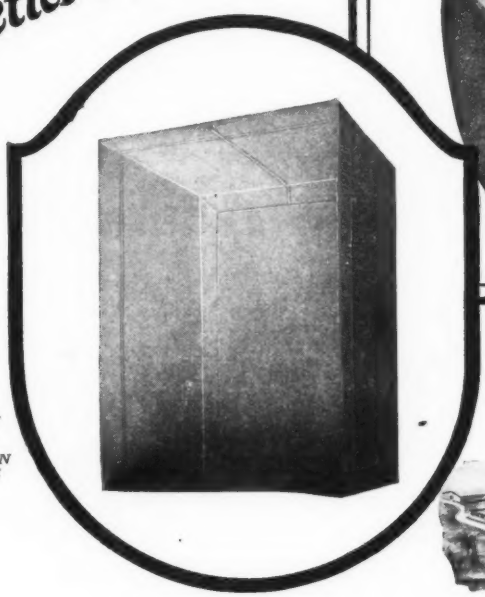
SALESMEN

Manufacturer of aniline dyes and specialties, wants good live-wire representatives in the Chicago and Philadelphia territories. Must have experience and a following. Big opportunities for right men to make good connections. State full particulars, etc. Address Box 320, American Dyestuff Reporter.

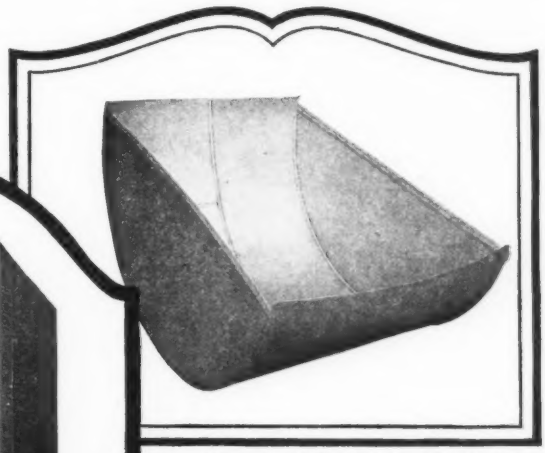
TEXTILE CHEMIST

Wanted—Position as textile chemist and dyer; have had experience on hosiery and piece goods; laboratory experience; college training; good references. Reply Box 321, American Dyestuff Reporter.

Old wood machines made "better than new"



Monel Metal lining for rectangular dye vat made by KLAUDER-WELDON DYEING MACHINE COMPANY



Above: Monel Metal lining for skein dyeing machine, showing welded construction. Made by KLAUDER-WELDON DYEING MACHINE COMPANY

Below: Aeroplane view of Klauder-Weldon Dyeing Machine Co. plant at Bethayers Pa.

Experience of users proves that Monel Metal linings outlast tanks

MANY different types of dye houses have found that Monel Metal lined dyeing machines are more economical because they last longer. They have found too, that Monel Metal machines also cut costs by speeding up color changes and cutting down the labor cost.

Even though your present machines are of the old wooden type, you can still profit through Monel Metal's economy by having your tanks lined with this long-lived metal. Monel Metal resists corrosion and it won't rust. It can be cleaned so easily and thoroughly that it prevents color "hang-overs." Monel Metal is strong as steel, stands up under hard use.

Call in your sheet metal worker and let him help you adapt Monel Metal to your requirements. In the meantime, let us send you full information about Monel Metal dyeing equipment, including definite facts and figures about savings effected by Monel Metal equipment in a typical plant. Write today.

Send for "List B" of Monel Metal and Nickel Literature

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67 WALL STREET NEW YORK CITY

Monel Metal is a technically controlled, uniform Nickel-Copper alloy of high nickel content. It is mined, smelted, refined, rolled and marketed solely by The International Nickel Company. The name "Monel Metal" is a registered trade mark.

INCo Monel metal

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Package Bleaching and Dyeing Machines—
Continuous Raw Stock Dyeing Machines—
Artificial Silk Skein and Spool Bleaching and Dyeing Machines

Total annual capacity of machines at work exceeds one hundred and fifty million pounds.

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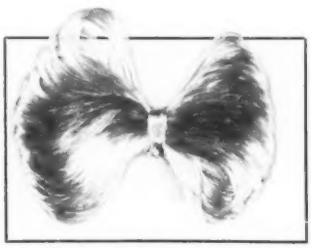
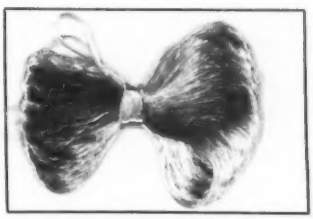
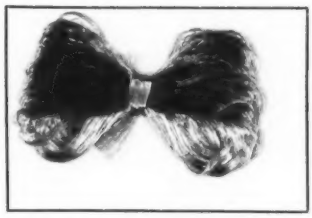
For the Greatest Fastness on Rayon Use



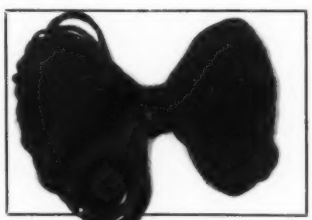
Akcothrene Yellow G Paste
5%



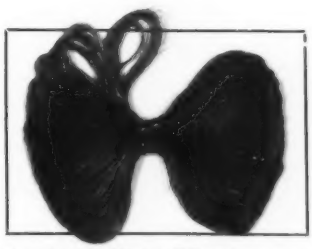
Akcothrene Golden Orange G Paste
5%



Akcothrene Pink FR Paste
5%



Akcothrene Royal Blue RS Paste
10%



Akcothrene Violet RR Extra Paste
10%

Formulae supplied on application

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Represented in Canada by A. Klipstein & Co., Ltd., 114 St. Peter St., Montreal

STANDARD PRODUCTS

UNIFORM STRENGTH

ACID COLORS

AKCO Fast Light Yellow 2G, 3G Ex.
AKCO Tartrazine N, NN
AKCO Orange Y, 2G
AKCO Acid Brown R, Y
AKCO Fast Crimson 6BS, G
AKCO Erythrosine B, Y
AKCO Fast Acid Navy Blue 2G, B, BK
AKCO Fast Wool Violet B, R Conc.
AKCO Acid Black 4BN, 10BN

CHROME COLORS

AKCO Chrome Fast Yellow G, 2G
AKCO Chrome Fast Orange
AKCO Chrome Fast Brown
AKCO Chrome Fast Red SW
AKCO Chrome Fast Green GS
AKCO Chrome Fast Blue
AKCO Chrome Blue Black 6B
AKCO Chrome Fast Black EHK
AKCO Chrome Fast Black DM

BASIC COLORS

AKCO Auramine O, OO Conc.
AKCO Phosphine G, 2G, 5G, etc.
AKCO Chrysoidine R, Y
AKCO Safranine Y
AKCO Fuchsine, Crystals and Powder
AKCO Brilliant Green Crystals
AKCO Fast Blue NS
AKCO Meldola Blue
AKCO Methyl Violet

DIRECT COLORS

AKCO Direct Yellow C, P, RL
AKCO Direct Orange R, TR
AKCO Direct Brown C, M
AKCO Direct Green B, Y Conc.
AKCO Direct Fast Red F
AKCO Benzopurpurine 4B, 6B, 10B Conc.
AKCO Direct Navy Blue R, B Conc.
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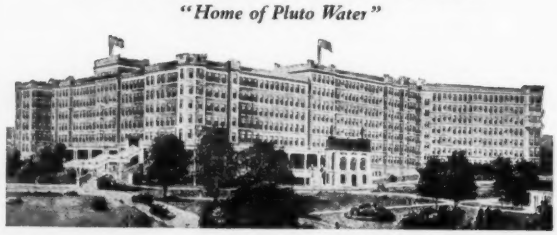

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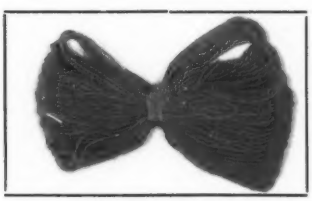

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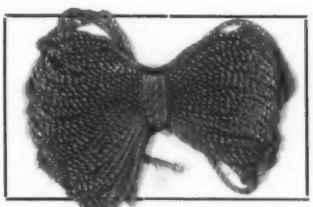

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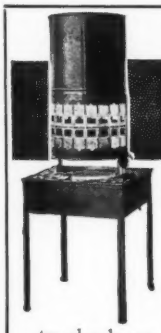

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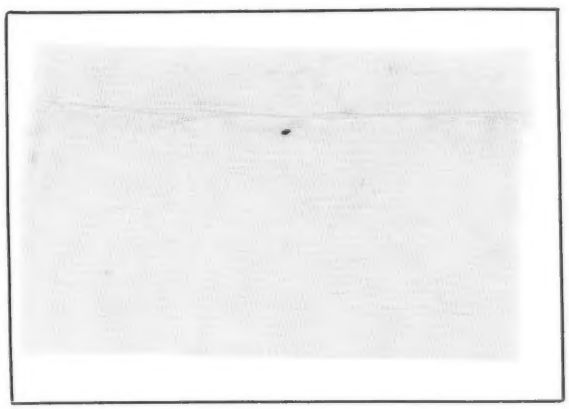

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